The Engineering and Mining Journal

VOL. LXXXIV. NEW YORK, DECEMBER 28, 1907. NO. 26.

Notes on Churn Drill Placer Prospecting

Discussion of Methods of Handling Core Material, Recording Results, Care of Tools and Equipment and Variations in Procedure

BY JOHN POWER HUTCHINS*

The advantages and disadvantages of the steam percussion drill as compared with the hand percussion drill depend entirely upon accessibility, environment, labor, and other conditions. These two types of drills have their advantages each in its own respective field.

The advantages of the steam percussion drill in the investigation of auriferous alluvion, in comparison with the steam revolving-core drill are several. The revolving-core drill gets but a small sample, it cannot use casing and it would work only with extreme difficulty among hard, loose boulders which are broken by percussion with comparative ease. It could not be used at all in testing auriferous alluvion containing such boulders. The lower cost of the percussion method is another important advantage.

In regard to the respective advantages of the drill and the shaft methods of prospecting, it may be said in general that it is because of the ease, the rapidity, the accuracy and the cheapness of the drill method for testing placers containing much water that the drill method is used. Shaft sinking under such conditions is slow and costly and often gives inaccurate results.

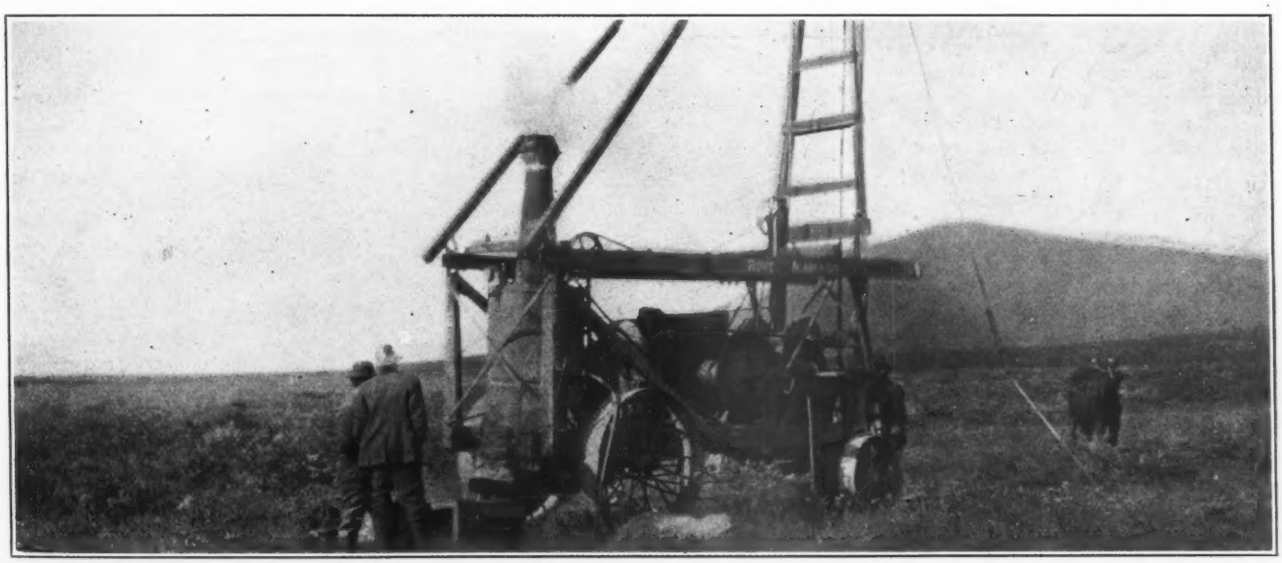
The traction drill is preferable to the non-traction machine particularly in drilling in arctic and tropic environments where draft animals are hard to get and to keep. The Keystone No. 3 traction is cataloged at $1160 and the weight is about 12,000 lb. while the non-traction machine of the same capacity and make is listed at $950 and weighs about 9500 lb. The difference in cost, freight and weight is not great enough to make the non-traction drill preferable. There are circumstances that make it good practice to haul the traction drill with draft animals, particularly on long hauls over rough roads. But it is an advantage to have the traction device for short moves; otherwise, it would be necessary to keep eight to ten horses available at short notice.

Like all other mechanisms that show great strength and resistance to hard knocks the Keystone drill is often much abused. Inasmuch as such abuse affects the working of the drill and tends to reduce general efficiency in all phases of the work, it should be prevented. The whole operation of testing auriferous alluvion is one of the utmost delicacy; any rough work in any phase of the operation tends to reduce the accuracy of the results. The drill and apparatus should be kept clean and well oiled and painted, and when laid up it should be housed or covered.

Sharpening Drill Bits

The drill bit should not be allowed to become very dull. While the action of the bit is to crush rather than to cut, it is still good practice to keep it sharp, for it then drills more rapidly and does not tend to drive materials out of the pipe or away from beneath the shoe. The shape of the bit is similar to that of a hand drill when sharpened for soft rock. The cutting edge is a straight line and makes a right angle with the median line of the drill. For loose gravel the cutting edge is sometimes made concave, that is, the corners are drawn out about ⅜ in. beyond the middle of the cutting edge. Such a bit works well in loose gravel, but it is not suitable for hard drilling. Of course a bit of this form must be sharpened more frequently for the corners wear rapidly, but the increased speed of drilling more than compensates for the extra time needed in sharpening. For hard gravel a thicker cutting edge is used. To sharpen and temper a bit requires about one hour.

The blacksmith's outfit of the Keystone drill includes a blower, set on the bed of the machine with a small steam turbine



DRILLING FROZEN GROUND WITHOUT CASING

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on its shaft, driven by a jet from the boiler. A 2½-in. canvas hose with a gas-pipe nozzle carries the blast to a small excavation in the ground which serves as a forge for heating the drill bit. A piece of steel of sufficient size for an anvil is fastened to a board which has a wooden rest to hold up the small end of the tool while the bit is being forged. Two or three men, one holding and one or two striking with sledges weighing about 10 lb., shape the bit roughly as required, and the drill-man finishes it with a light hammer; it is then allowed to cool. In tempering, the bit is heated to a cherry red and quenched. Tempering to the proper hardness requires considerable experience.

Drill sharpening is usually done by the drill-man and fireman either before or after drilling hours and for this they are allowed extra pay. It is not necessary to discard the bit when a corner is broken as is the practice in rock drilling; it is generally continued in use until the bit becomes dull. The corners must have plenty of metal drawn down behind them to add strength, but no shoulders should be left to catch fragments and cause jamming. It is good practice to have drill bits sharpened by a blacksmith, if a shop is convenient, for it is hard work when done by the crew, and in taking more time, consuming fuel to run the blower, etc., it is generally more expensive. It also tends to lower the drill-crews' efficiency. It is good practice to have at least three bits for each machine.

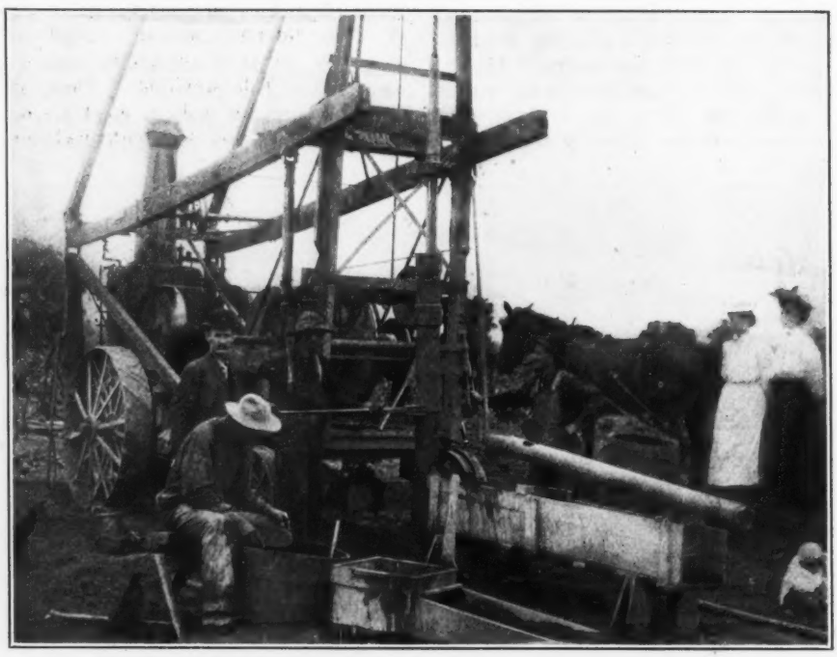
Care of the Sand Pump

The sand pump seldom gets out of order, but it is good practice to have several complete foot valves on hand. The valve, of the ordinary flat type, is a piece of sole leather reinforced by a steel plate. The leather wears out at the hinge and it also wears where it comes in contact with the valve seat. Leakage caused in this way should be remedied immediately by putting in a new leather.

Sometimes the valve does not seat tightly because of obstructing material between it and the seat. It is one of the duties of the drill-man to watch the sand pump while it comes into view while being hoisted out of the casing. If it is not full of water there is leakage. The pump is then lowered again with a rush and again hoisted. If there is still leakage it is probably caused by an obstruction on the valve seat which must be knocked out after the pump is allowed to leak all its content of water into the pipe. When a pump grows old and worn, leakage may occur around the rivets.

Sometimes, especially after the sand pump is old and the lower rim is worn slightly round, a small, hard pebble may jam between the rim and the pipe as the pump is dropped. In this case it may require a hard pull with a jerk to free the pump. If the sand-line friction is not powerful enough to free the pump, the line may be made fast to the drilling cable, when the greater power of the cable drum will ordinarily loosen it. Care must be observed to increase the pull gradually and not to jerk too violently, for there is danger of breaking the sand-line or the bail of the pump, especially when old and worn by friction in the pipe. If the line or pump-bail gives way the pump must be recovered by fishing.

In pumping sticky material or tuff bedrock which generally becomes sticky when drilled up, considerable vacuum has to be overcome. Some skin friction results when the pump is dropped into fine homogeneous material that will run up between the pump and the pipe; but this is not generally sufficient to cause difficulty, and the pump is usually picked up easily with a jerk, although a pull probably more than 1000 lb. is often necessary. The sand-line should be of manila rope at least 1 in. in diameter; 1¼-in. rope is often used, and smaller line is sometimes employed. Hawser-laid cable is better than rope, being stronger for the same diameter.



AN ARRANGEMENT OF CLEAN-UP APPARATUS

Accessories

The drilling outfit is not complete without a number of important accessories. Among these are the water wagon and team, a wagon for hauling wood, a canvas fly, a sled, a tent for the panner, a sluice box, a rocker, panning tubs, water barrels and gold pans.

The water wagon may have a wooden or a galvanized iron tank. The latter is preferred in case it must be shipped frequently, but it has several disadvantages. It is subject to leaks and often needs repairing and it usually has a special platform on the wagon bed which raises the tank to such a hight that it is hard to lift water with a bucket from the source of supply in filling it. Wooden tanks require fewer repairs, and since they rest directly on the wagon bolsters are nearer the ground and more convenient. The tank generally used holds about 500 gal. For the severe work of hauling the water wagon, heavy horses are obviously better than light animals. The water wagon should be coupled up short so as to make short turns possible. The wood wagon has no peculiarities but it should also be coupled short. Wide tires are advantageous on both, for there is usually much soft ground to be crossed.

The sled is made like an ordinary farm sled with runners of about 3x10-in. stuff 7 ft. long, shod with steel. Three pieces about 2x8 in. and about 4 ft. long are joined into the top of the runners and securely nailed. The whole sled is then usually, though not necessarily, floored with 2-in. stuff; iron sockets are bolted to the side of the runners and 3x4-in. standards are used. A plate with an eye is bolted securely to each runner and a chain with a ring in the middle and a hook on each end, to fit the eye, completes the outfit. A sled of this kind is extremely convenient and, as the dimensions indicate, it must be strong. It is used to transport pipe from one hole to another. Its platform is near the ground, making little lifting of drive-pipe sections, big wrenches, pulling hammer, etc. necessary. It is also used as a platform to hold the pipe.

The canvas fly for the drill is used in

wet weather particularly to protect the frictions and drill cable. It is merely a canvas roof supported on the timbers of the drill by a framework which is usually improvised. It is fastened to stakes driven in the ground. It is sufficiently large to cover the whole machine, except the derrick and the boiler, and it projects about 6 ft. beyond each side of the machine. This protection makes drilling possible in any but rain storms accompanied by heavy wind. When the frictions get wet they do not work well. In rainy weather, this fly is used constantly. In moving from hole to hole, it takes less than 15 minutes to stake the sides down, for the fly is not removed, but remains rolled up on the drill frame.

Panner's Outfit

The panner's tent should be an umbrella tent which is supported on a single pole made to fit a gas-pipe socket that can be hammered into the ground. This tent has side curtains which are not used in fair weather. It is useful in sunny weather to furnish shade which is almost essential for close examination of concentrates in the gold pan.

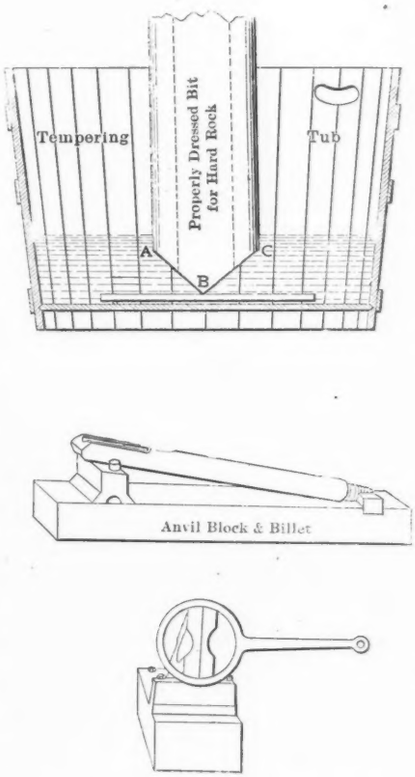
The sluice box, more properly a dump box, is a box 12 in. wide and 11 in. deep of 1-in. dressed lumber. It is about 8 ft. long and is set on a grade of about ¼ in. to the foot. A sliding gate the depth of the sluice is inserted in the lower end; the upper end is closed. The gate has three ¾-in. holes, two on the same horizontal line about 4 in. apart and 3 in. above the lower edge, and one in the middle 3 in. from the top. Wooden plugs are provided for these holes. A cross piece is nailed between the sides. The use of this sluice box is to catch slime and splash. When the box is full the plugs are removed, the upper one first, and the water is drained off into a trench or into a tub and then into a trench which leads to a sett ing pool where the slime is again settled. This sluice is sometimes made of sheet steel and it then has a semi-circular cross section. The sluice box is set on horses or blocking at a convenient hight for dumping the contents of the sand pump into it. It must be well made and be kept tight.

The rocker used is of the ordinary type but sometimes it is small, for inconsiderable amounts of material are run through it. Burlap is considered a good gold saver on the rocker bottom, although it makes clean-ups slower and this is an essential consideration if, as is sometimes done, the rocker is cleaned up after each two or three pumpings. This of course is necessary only when the pumpings are rocked before panning in drilling rich ground and when particular pains are being taken to note the depth and position of the rich gravel strata. Straps and buttons are used to hold the burlap in place at the upper end and the two sides.

Panning tubs are ordinary galvanized-iron tubs with vertical sides. These should not be too large. In large tubs cross waves are produced in panning and these interfere with the operation.

Handling Core Material

After driving 1 ft. in loose medium gravel there should be from 14 to 18 in. of core. This rather large variation is due to several causes. Gravel strata may be of widely different composition although of similar hardness. One stratum may contain considerable sand, another little sand and much fine gravel and another may contain considerable clay. When the pipe is driven through such materials, breaking them loose, there must be different degrees of expansion due to different proportions of voids or interstices. When the casing is driven through fine free gravel the results of these differences of the constituents are less notable. In medium and coarse gravel, having no sand or fine pebbles, particularly that which is indurated, rather surprising expansion of core may result.



DEVICES USED IN SHARPENING DRILLS

All cores should, under normal conditions, show expansion. Even with loose gravel the material is contained in a cylinder of smaller diameter than that occupied in place, and the loosening effort of driving forces it to a higher level. It is sometimes the practice not to measure the depth of the core after driving until two or three blows have been struck with the drill to compact the material. Sometimes the core is not measured after pumping and before driving.

Gravel is generally assumed to expand 33⅓ per cent. when loosened from place. While this may be a correct estimate for drifting and hydraulic mine gravel it is too great for dredging gravel which is generally loose.

Work of the Panner

It is the particular duty of the panner to attend to the material that comes out of the hole. He catches the drillings in a gold pan and washes the sand pump to clean it thoroughly after each pumping. He then rocks the contents of the pan, washes the contents out of the rocker apron into a gold pan, and then pans this material in clean water. He estimates the weight of the gold in milligrams or counts color and allots each to one of three sizes. No. 1 is 3 mg. or more; No. 2, 1 to 3 mg.; No. 3, 1 to ⅛ mg.; anything less than ⅛ mg. is grouped with other undersize colors to make in aggregate a color of No. 3 size. These are the two methods generally practiced in estimating the value of dredging ground, without weighing, to ascertain where the richest strata occur. The panner records these in his log-book. He records the time of moving and setting up the drill, the time of starting and finishing a hole, the time consumed in driving, drilling, and pumping, pulling the pipe and the time lost due to stoppages for accidents, repairs, etc. He also keeps a record of the length of drive and the depth of each core before and after pumping.

The method of keeping track of the core is as follows: The first section of pipe with the driving shoe attached is marked at intervals of one foot with a piece of chalk and each successive section is marked in the same way. The depth of the pipe in the ground after each drive is thus determined. The length of the shoe joint is marked on the drill bit with chalk and each successive joint on the cable with a colored crayon or small nail driven into the cable. The distance of the mark above the pipe when the tool is hanging in the casing and in contact with the core shows the depth of core in the pipe.

It is the duty of the panner to see that the whole operation is conducted so as to get accurate information and results. His work is, therefore, important, for the drillman has a natural inclination to operate for speed rather than for accuracy. The panner should understand the whole operation thoroughly and be able to tell whether or not the manipulation has been properly conducted. When the hole is finished, he cleans up to collect all material from the slime that may have settled in the sluice or elsewhere for final treatment, and records separately the amount of gold recovered in this way.

He then rocks all the material that has been rocked and panned once and cleans up the rocker completely and pans the clean-up. He estimates the gold recovered in this way and records it as gold from tailing. He then puts all the gold recovered into a porcelain basin. Some panners use a screen of about 20 mesh, the undersize being washed through. The screenings are carefully examined for gold; all clay is disintegrated thoroughly and its characteristics noted.

He puts one pan in the clear-water tub on the bottom and pans his concentrates very carefully until he has about four tablespoonfuls of material left. Sufficient bright active quicksilver is added to more than amalgamate all the gold, and the pan, containing a little water, is so manipulated as to bring all colors into contact with the quicksilver. In cold weather, warm water is used to facilitate amalgamation. When particles of gold do not amalgamate, they are examined to ascertain the cause and this circumstance is recorded. It may fail to amalgamate because of a coating of iron oxide or from some other causes. These colors are brightened and cleaned by rubbing them with the finger against the gold pan. The amalgam is then poured into a vial labeled with the number of the hole.

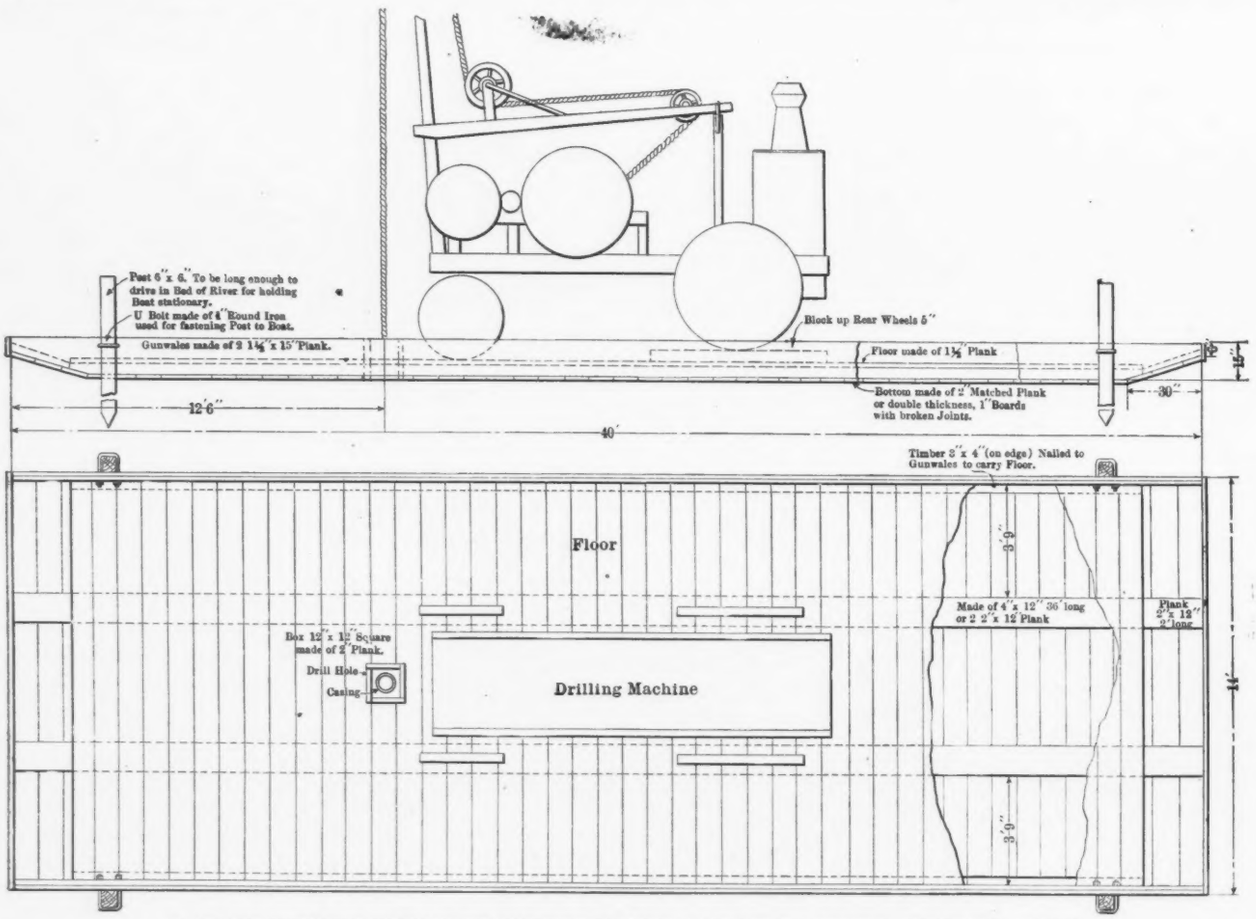
Gold pans used in this work must be well cared for and it is good practice to blue them by heating in a fire until they show the proper pigeon-wing blue. This color makes a good background upon which to see gold. All water used in the prospecting operation may be run into a sump 3x3x2 ft. dug into the ground. This will usually hold all the material from a hole 40 ft. deep. Everything from the drill hole is allowed to settle in this sump. A stake driven into the bottom serves as a measure for the depth of material in the sump as drilling proceeds.

Variations in Handling Material

Practice in handling material is somewhat varied and is largely governed by the conditions encountered in any test. When ground already mined by drifting or tailing from previous mining operations is being investigated, the discrepancies between the theoretical and the actual cores present a number of difficulties. Extreme vigilance is then needed to note the peculiar conditions, and experience and judgment must be used in making the proper allowances. It is the panner's duty to look after this phase of the work, although adjustments are often left to the man in charge of the investigation. The panner is paid about $3 per day of nine hours.

There are two methods of recovering the gold from the drilled material. The more common method is to pan the material first in water that is usually muddy, sometimes very muddy, and to put the concentrates into the porcelain basin. Another way is to rock the material, first using clear water and then to pan the contents of the apron in additional clean water. Another way, not generally practised, but worthy of mention, is to dump the sand pump into the sluice box and allow the material to run from it directly into the hopper of a rocker. This is not generally practised because of the awkward manipulation of the sand pump (the sluice being necessarily high) and of the trouble of cleaning the sluice after each pumping.

The essential difference between the two methods first mentioned is in the use of clean water, which allows a good inspection of the material in the hopper, in the rocking operation and the two operations of rocking and panning, while in the other only panning is done. It is claimed by the advocates of the rocker method that the work can be done in less time, even though the material is rocked and panned, and that a better saving can be accomplished because both rocking and panning are carried on with clean water, and that the results justify


Post 6″ x 6″ To be long enough to drive in Bed of River for holding Boat stationary.
U Bolt made of 4″ Round Iron used for fastening Post to Boat.
Gunwales made of 2 1½″ x 15″ Plank.
Block up Rear Wheels 5″
Floor made of 1½″ Plank
Bottom made of 2″ Matched Plank or double thickness, 1″ Boards with broken Joints.
12′6″
40′
30″
15″
Timber 2″ x 4″ (on edge) Nailed to Gunwales to carry Floor.
Floor
Box 12″ x 12″ Square made of 2″ Plank.
Drill Hole
Casing
Drilling Machine
Made of 4″ x 12″ 36″ long or 2 2″ x 12″ Plank
Plank 2″ x 12″ 2′ long
3′-0″
3′-0″
14′

PLAN AND ELEVATION OF FLOAT FOR CARRYING DRILLING MACHINE FOR TESTING SUBMERGED GROUND

the greater amount of water needed. The advocates of the panning method claim that close saving cannot be made in the rocker, and that an excess of gold goes over into the tailing, and while this does not affect the value of the hole, as the tailing is always washed again, it may result in rich strata not being noted as such. They also claim that better saving can be made with the gold pan and that it is easier work for the panner.

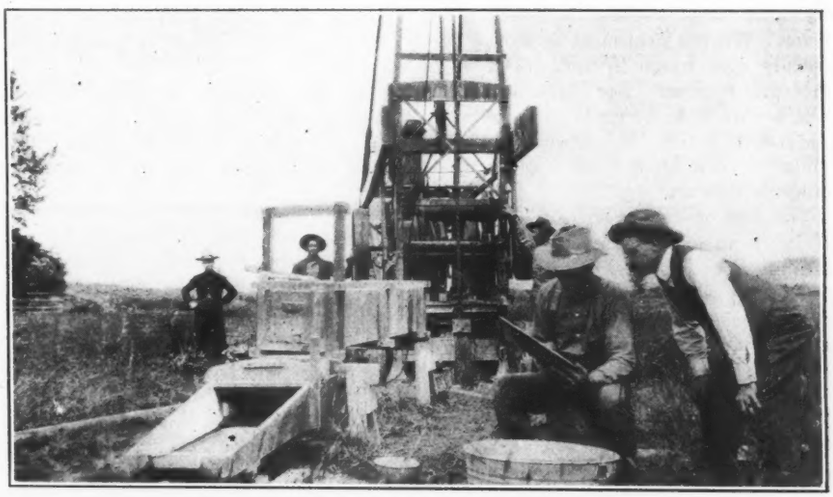
Estimating Value of Deposits

The amalgam from the clean-up is treated with dilute nitric acid which dissolves the mercury. Hot water is generally used to completely remove all traces of the nitrate of mercury. It is essential that great care be used in manipulation and in washing and drying the sample, so that no particles of gold shall be lost in the wash water or by spattering when the last drop of the water vaporizes in drying the sample. If the sample is dried in a porcelain cup, a few drops of alcohol added to the last wash will prevent spattering. If the drying is done in a clay annealing cup, there is no danger of loss from this cause.

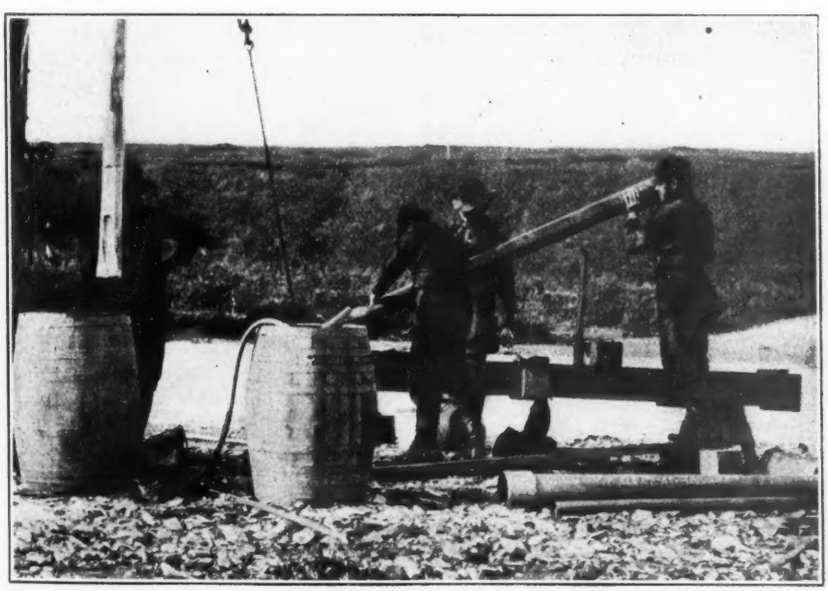
In some foreign investigations a different method of parting has been used, the mercury being volatilized by heat, gradually raised to about 700 deg. F. This is not as good practice as the acid method, for the presence in the amalgam of substances not volatile at that temperature may introduce errors. If there are no contaminating substances and the amalgam is thoroughly clean, and chemically pure quicksilver has been used, there can be no objections to parting by means of heat. The manipulation is easier than with nitric acid but not so accurate and certain. Great care in gradually applying the heat so as to avoid too rapid volatilization of the mercury must be observed or explosions may occur.

In weighing the gold the ordinary assay balance may be employed. The value of one milligram of gold found in the California dredging fields is assumed to be 0.06c. It therefore takes 100 mg. to make a value of 6c. Pure gold has a value of 6.6455c. per 100 mg.; the gold is therefore assumed to be about 0.900 fine when a value of 6c. per mg. is allowed. Since gold with a larger proportion of base may be encountered in testing dredging ground, the fineness must be ascertained in each investigation so that a proper value may be allowed. In a Nevada investigation gold only about 0.600 fine was found.

While the calculation of the value of a deposit may seem to be a mere matter of arithmetic, there are several inherent difficulties. To be sure the average value assigned to an area is generally an arithmetic mean of the average gold contents of the total number of holes drilled. The average gold contents per cubic yard of each hole is multiplied by its total depth in feet to give each hole its proper weight, the sum of these products is divided by the sum of the depths of all the holes; this gives the average value per cubic yard for the whole area represented by the drill holes. But the results to be anticipated from actual exploitation, to be correct, must be approximated with the aid of allowances of various kinds which can only be made by one who is capable of making the proper deductions.



TESTING FOR GOLD IN IDAHO, SHOWING SET-UP OF DUMP BOX AND ROCKER



EMPTYING SAND PUMP

Night Work

When time is limited it is good practice to drill night and day. Two or three crews may be employed; if the time is very short three crews are better than two, and the advantages of having one crew come to work before the other quits are several. Night work is carried on by means of gasolene torches. As good progress can be made by artificial light, as by day light in actual drilling, but moving is, of course, handicapped by darkness. Slightly more fuel is needed at night because of greater radiation. Some of the panner's work which needs a strong light is left for the day panner to do. Hauling wood and water are usually severely handicapped by darkness.

Water and Fuel

The steam percussion drill of the Keystone type requires about 30 gal. per hour for the boiler and about the same quantity for the treatment of the core in the pipe and in the pan, rocker and sluice. Considerably more or less may be required. Economy in the use of water can be effected by care in the treatment of the pumpings, but operations carried on in muddy water are apt to involve a lower degree of accuracy, for

panning or rocking in muddy water is likely to result in the loss of fine gold.

About one-half cord of good wood or its equivalent of oil or coal is burned per day. The same respective advantages of these fuels apply for drilling as for other operations. Conditions of economy and convenience dictate the choice.

Speed of Drilling

No average of speed can be given, for the rate varies greatly and depends entirely upon the conditions encountered. As much as 50 ft. may be drilled in 10 hours. When a drill must be moved frequently over rough or soft surfaces, as in testing shallow river flats, less than 5 ft. per day may be made on an average. Indurated gravel, big boulders, buried timber, frozen ground, all tend to make progress slow and costly.

The cost of drill investigations is generally in an indirect ratio to the rate of drilling. The cost may vary from 50c. to $5 or more per foot in California. When hostile conditions are encountered, as in arctic and tropic environments, the cost may rise above these figures. Contracts for drilling areas in California have been let for $2.50 per ft. This figure is a fair one under favorable conditions, but work done under contract has in numerous cases given misleading results.

It is not good practice to contract work of this class, for care is the first consideration. The drill-man is under constant temptation to sacrifice accuracy to speed. In one investigation in California, about 150 drill holes were sunk by contract on about 150 acres of ground at a cost of about $7000. A dredge has been at work on this area during about five years and prospecting and dredging results have not tallied well at all. In one investigation, carried on by a contract drilling crew, holes were in many cases continued to considerable depths into bedrock, the bedrock in this particular case being easily drilled and the extra depth increasing the earnings of the drill. Even when the contract is taken with the best intentions, a careless or complaisant panner may easily be imposed upon by an unscrupulous drill-man.

The Highland Boy Smelter

According to press despatches, the farmers of Salt Lake valley, at a mass meeting Dec. 11, voted to allow the Utah Consolidated Mining Company to operate the Highland Boy smeltery until March 1, 1909, in consideration of the payment to them—the farmers—of a large cash bonus, to be negotiated. The despatches indicate $200,000 to $300,000 as the idea of the farmers. The company is said to be willing to pay $100,000, and, moreover, to settle for actual damages in the usual manner.

Mount Radiant, a New Zealand Copper Discovery

By Sydney Fry*

A discovery of copper ore which appears to be about the most promising that has been made in New Zealand, is that of Mount Radiant, 14 miles southeast of Karamea, a farming settlement at the mouth of the Karamea river. The first outcrop was found near the top of the mountain, at an altitude of 3600 ft. above sea level.

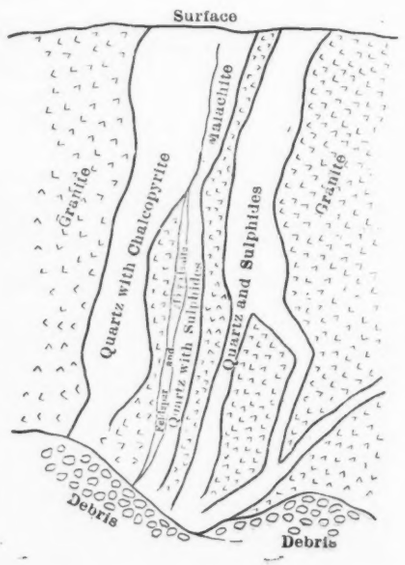
The deposit occurs in a zone of metamorphic granite, and porphyrite 260 or 300 ft. wide, which has been considerably shattered by earth movements and, the resulting network of fissures has become filled by hydrothermal action, with quartz and metallic sulphides, chiefly chalcopyrite and molybdenite. Also, as a result of atmospheric agency, there occurs some little quantity of malachite and molybdite.

The sulphides are disseminated throughout the quartz veins and the adjacent granite; sometimes they occur in richly mineralized nests or pockets, or as veins of pure ore, these latter being the outcome of another earth movement following the period of primary deposition, the cross fractures from this disturbance having become filled during a rearrangement of the metallic contents. Picked samples of the chalcopyrite, free from gangue, gave on analysis 20 per cent. metallic copper, and other samples of the quartz containing chalcopyrite, carried 0.138 oz. gold and 0.87 oz. silver per ton.

Outcrops of the ore have been found for a distance of five miles along the strike, and in the sides of the gorge of the Wanganui river at a depth of 2000 ft. below the outcrops first found, up on the mountain at Silver Creek. In short, it may be described briefly as an enormous low-grade deposit with probably some bonanzas of ore in places; but it will take some prospecting on a rather large scale, before it can be ascertained with certainty whether the grade is high enough to be payable on the average. At the time of my visit to it, a few months ago, it was untouched and nothing beyond a little surface scratching to lay bare the outcrops, has been done since.

There is abundant water in the locality, suitable for power purposes with plenty of fall, and unfailing supply, for the rainfall is considerable. There is also an abundance of excellent mining timber, and there occur in the immediate vicinity great deposits of a splendid limestone for smelting purposes. But although there is a great deal of talk about smelting, I am of opinion that wet methods will suit this ore the best and experiments are at present being made in that direction. The New Zealand Mines Department is at present constructing a trail to Mount Radiant from Karamea to facilitate prospecting operations.

COAST OF NEW ZEALAND SHOWING LOCATION OF MOUNT RADIANT



SECTION OF COPPER DEPOSIT, MOUNT RADIANT

*Director, Westport School of Mines, Westport, New Zealand.

According to *L'Electricien*, a Vienna firm has recently placed on the market brushes made of glass, which are to replace emery cloth for cleaning and polishing the commutators of dynamos and motors. These brushes are said to clean the commutators without scoring the metal, and their use avoids the inconveniences and dangers of emery cloth.

Hoisting Ropes for Mines—IV*

Report of the Transvaal Commission. The Best Methods of Testing New Ropes and Ropes in Use. The Attachment of Ropes to Cages

BY U. P. SWINBURNE AND ASSOCIATES

In dealing with the important matter of how best to ascertain the true strength of a new rope, the weight of evidence is in favor of a tensile test to destruction of a sample of the whole rope. Some manufacturers state that the true breaking load can be calculated from the aggregate strength of the wires, but there still exists a considerable diversity of opinion among experts as to the percentage reduction that should be made from this total to take account of the fact that the wires, when laid up in the form of rope, are not in a position to give out their full efficiency. One manufacturer advises a deduction of 8½ per cent. while others state 10 to 12 per cent. There is also a lack of agreement as to whether or not these deductions should vary according to the construction of the rope. As a practical acknowledgment of the inaccuracy of these assessments for use generally, it is found that the majority of the manufacturers who export ropes to the Transvaal prefer to give the strength of the rope as the aggregate of the strength of its wires, and allow the purchaser to make any deduction he may think proper.

Tests of New Ropes

Mr. Epton, after a large number of tests of new ropes of various manufacture and contruction, found that a difference of from 3 to 16 per cent. existed between the aggregate strength of the wires and the breaking load of the rope. Thinking that this loss of efficiency might disappear after the rope had been well tightened in the course of a few weeks' use, some further tests were made under these conditions. The results point to the conclusion that this efficiency is not regained.

Seeing that it is highly desirable in the interests of safety that the real breaking load of a new rope should be known in preference to the theoretical ultimate strength, the commission is led to the conclusion that the only correct method is to test a whole sample of each new rope before it is put into use; that is to say, each new rope should be delivered to the purchaser accompanied by a test certificate, which, if not obtained in the country of origin, should be procured from the Government testing house in the Transvaal, duplicate certificates being allowed for separate portions of the same coil.

As to the length of rope required for such a test, opinions vary, some witnesses saying that a length of 2 ft. is sufficient while others consider that it is necessary to use at least 10 ft.; but from experiments made in the Transvaal Mines Department mechanical laboratory, very little difference appears to exist even in these limiting cases. The results of comparative tests between long and short samples of two ordinary winding ropes are made public by Mr. Epton. In one case there was practically no difference, and in the other case, in which a length of 4 ft. 4 in. was compared with a length of 14 ft. 10 in., a difference of 900 lb. in 50 tons was found, this being in favor of the shorter test length.

Several different methods of holding the whole rope specimen during test appear to be in vogue, but the best and most frequently used is to open out, clean and tin the wires, and then run on a soft white-metal conical seal. In the Mines Department laboratory it is the practice to use an ordinary commercial white metal which has a melting point of about 375 deg. F., and has been found not to damage the wires in the least degree.

It is considered a proper practice to apply to the individual wires of a rope other standard tests, such as tension, torsion, and bending tests. These are very useful to mark down a very inferior wire, or to show up large departures from uniformity.

Tests of Working Ropes

To determine the strength of a winding rope during its working life, the evidence taken appears to show that the best method is to re-cap the rope at intervals of from three to six months, and to have a portion of the rope cut off for testing purposes. It is also strongly advised that a thorough examination should be made of the wires at the same time for corrosion or any other deteriorating influence by means of a magnifying glass or microscope. It would be more correct to make the interval between successive re-cappings dependent on the duty of the rope, but this course is obviously impracticable. The mining regulations of the Transvaal provide for regular re-capping, not more than six months being allowed to elapse between successive re-cappings in the case of a round rope, and three months in the case of a flat rope. A portion of the rope cut off in length not less than half the circumference of the pithead sheave, must be sent to the Government mechanical laboratory for testing. The practice followed in the laboratory is to furnish a certificate of the actual breaking load of the specimen, and at the same time to call the attention of the mine manager to any defects, such as brittleness, corrosion, want of lubrication, etc. This practice is in every way commendable, but we would recommend that the six months' period should apply also to flat ropes, which are no more difficult to examine than round ropes.

Elongation Tests of Working Ropes

With reference to the utility of an elongation test of the whole rope, from time to time, during its working life, opinions seem to be about equally divided. Some witnesses think it would be an advantage at stated intervals to ascertain the stretching power of the rope when hanging in the shaft, by applying its usual working load or something in excess of this. Others think that no useful purpose would be served, and that certainly loading in excess of the normal conditions might do damage. Professor Joseph Hrabak, of Pribram, carried out some interesting experiments to determine the elongation of wire ropes under known loads, and thus to find out the modulus of elasticity. He refers fully to these in his book "Die Drahtseile," and from the description of his tests it appears that the data were arrived at by loading the cage with men in many deep-level vertical shafts, and noting the elongation thus produced in the rope. In a 3000-ft. shaft the elongation amounted to about 1 in. per man, and it is, therefore, capable of being measured reliably and accurately. The modulus of elasticity of a winding rope will vary during its working life, being small at first, afterward increasing to something nearer the value of the modulus of the wire itself, and then, if the rope is kept in use long enough, it will probably decrease. This last effect, if observed, is to be taken as a danger signal, pointing to the deterioration of the rope.

On the whole, the commission considers that the practice of making elongation tests of the whole rope is to be recommended, but that the ordinary working load should not be exceeded to more than the extent of doubling the authorized load of the skip or cage. It is also strongly recommended that when a winding rope is taken off and its life considered ended

*From the report of the commission, appointed by the lieutenant-governor of the Transvaal, to inquire into and report upon the use of winding ropes, safety catches and appliances in mine shafts.

for the particular purpose for which it was installed, a sample from the most worn place should be tested. The results of these tests should prove of the greatest service to the person who has had charge of the rope, as they would enable him to see how far his judgment was sound concerning its condition. It is not recommended that this practice should be made compulsory, for the reason that it would probably involve in most cases the wrecking of any utility that the rope might still possess for purposes other than that of transporting persons.

Reduction of Sections by Wear

An important question arises in this investigation, as to what loss of strength a rope has sustained owing to the removal by friction, etc., of a certain definite proportion of the cross-sectional area of the wires. To come to any sound conclusion regarding this matter, it is necessary to know what support is afforded to any individual wire by the gripping tendency of the adjacent wires. Mr. Epton submitted the results of tests conducted by him of two rope samples, 26 in. in length between the grips, each specially prepared by having 10 of the outside wires cut through. These tests showed that the supporting effect of the sound wires on the broken wires amounted practically to nothing. These rope samples were new or only slightly worn.

Of 91 complete tests of worn ropes carried out in the Mines Department mechanical laboratory, 33 show that the laid-up wires have a greater strength than when tested individually at the most worn part, and 49 show the opposite, while eight give almost the same results, whether tested as separate wires or in the form of a rope. It is interesting to note that the great majority of the ropes which tested higher than the aggregate of their wires, were of the simple construction, six strands of seven wires, 6.6.1. All these results go to show that in a short length of rope—2 or 3 ft.—the strength of the rope cannot fairly be assumed to amount to more than the aggregate strength of the wires, estimated in each case at the position of greatest wear, although these positions may not all occur at exactly the same point in the rope.

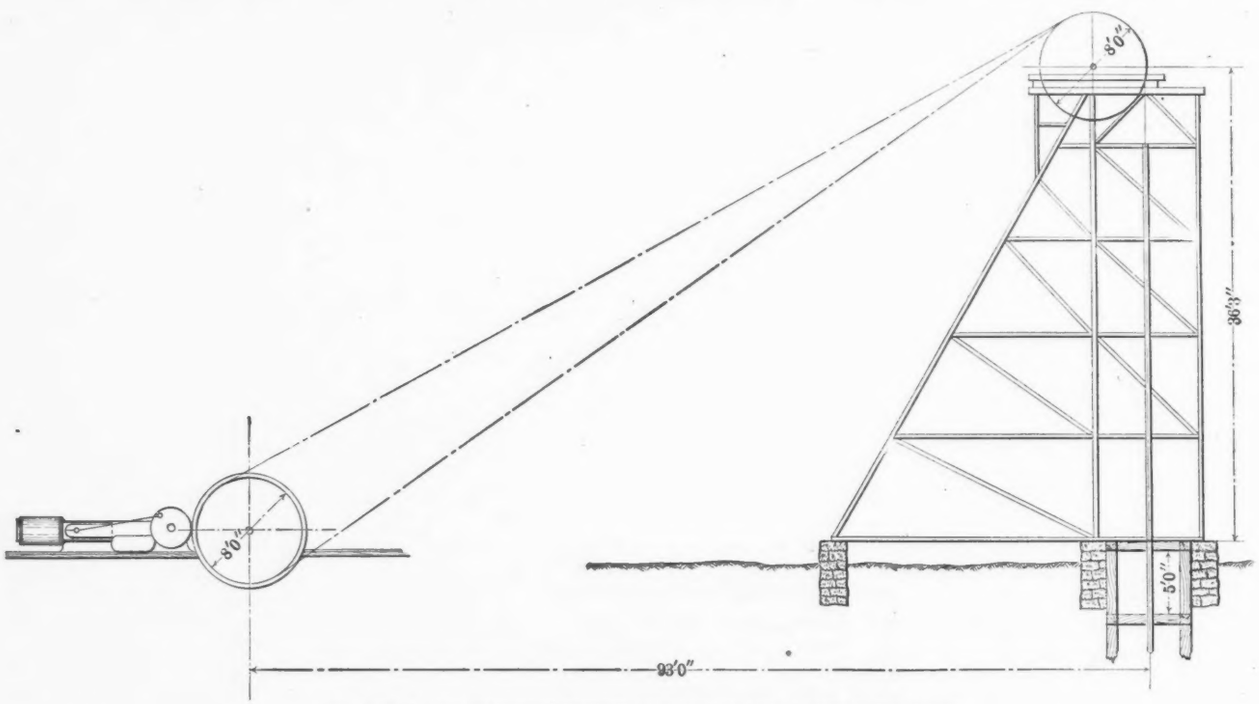
Mr. Epton stated that in only five cases out of over 400 had he found ropes to break at a much lower load than was estimated from external appearances, the estimation having been made by assuming that there was no lateral support between adjacent wires. In these cases there were excessive internal corrosion and wear, and the first-named defect would probably have been quite as pronounced in a sample cut off from the end of the rope.

Factor of Safety

The commission carefully considered this important matter, and recommends that the present regulation, which provides for a factor of safety of 6 as a minimum during the life of a rope should be adhered to. No reliable statistics were brought forward by any witness, and none were otherwise available, dealing with the working of winding ropes at a lower factor of safety than 6, and the commission is of opinion that considerable experience should be obtained with ropes working at lower factors while hoisting mineral, before any departure could be recommended for the Transvaal practice, which has been found to be satisfactory.

The breaking of a winding rope while raising or lowering persons happens very rarely, and since mining was re-started on the Rand in 1901 there have only been two such occurrences—this is neglecting an accident which occurred on a mine where 23 persons were killed owing to a rope, in good condition, being cut in two while lowering the cage, by a projecting bolt in the flange of the drum. Although causing great loss of life—in one accident 44 and in the other 26 persons were killed—it must be recorded that in each of these two cases the rope had been allowed to deteriorate until the factor of safety was far below 6, the persons charged with the responsibility of examining these ropes having failed to detect this. These statistics, as well as others concerning ropes that have been broken when no persons were traveling, satisfy the commission that a minimum factor of safety of 6 is sufficient.

E. J. Laschinger stated that, considering the great variations to be met with in the design of engine details and in the general arrangement of the winding plant, it should be permissible, especially in deep shafts, to make allowance, in fixing the factor of safety, for special attention paid to the design of the plant which has for its object the insuring of best working conditions and the safety of persons traveling in the shafts. W. S. Thomas also favored this idea and agreed that, after a certain critical depth,

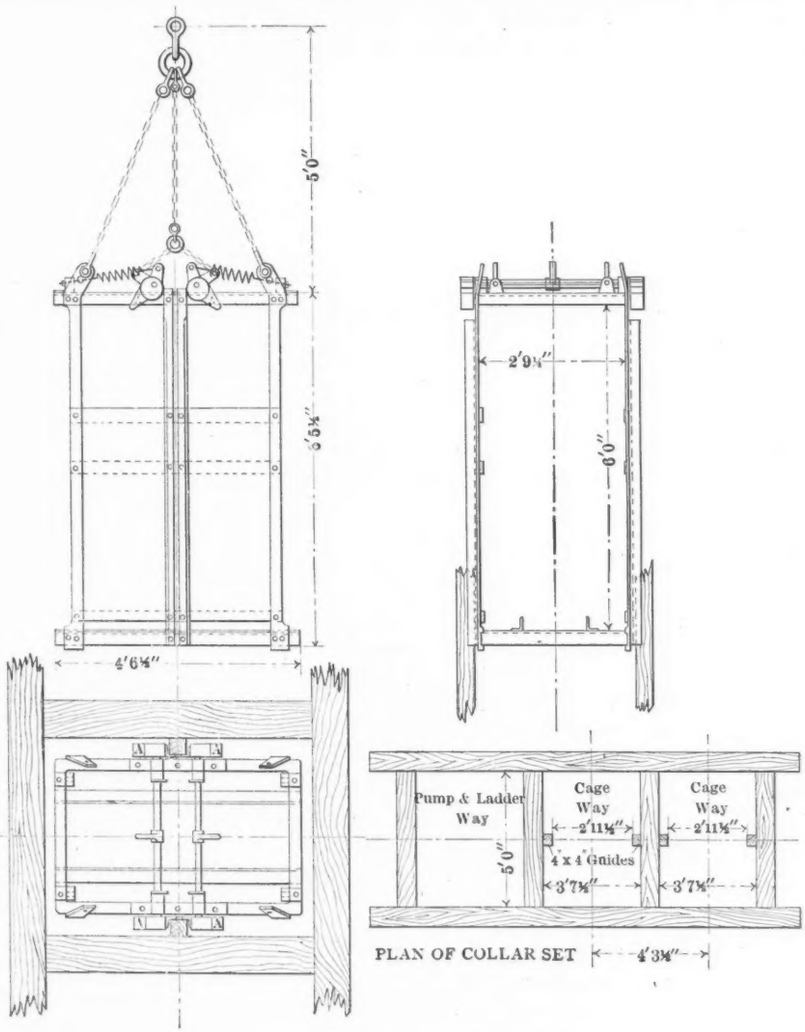


HEADGEAR AND HOISTING ENGINE, MARCUS SHAFT, LANGLAAGTE MINE

there was good reason to believe that safety might be assured by the maintenance of a stated reserve of strength, as there are many deteriorating influences which do not increase with depth.

Hoisting from Deep Shafts

In deep-level winding, from 4000 ft. and over, it is practically impossible to start off with a statical factor of safety of more than 7 in the rope. When reduced by wear to a factor of safety of 6, and about to be discarded after, possibly, no more than six months' work, this rope will still have an enormous reserve of strength, considering statical conditions only. Quoting from a paper read before the South African Association of Engineers in March, 1904: "Imagining for a moment that similar loads of, say, 7 tons each—consisting of 6000 lb. conveyance and 8000 lb. contents—have to be hoisted from two shafts, one of 1500 ft. and the other of 6000 ft. in depth. Supposing the ropes used in these two instances are of the same grade of steel (120 tons per square inch), then, if they are compared at a time when they each have the minimum factor of safety of 6, it will be found that the reserve of strength in the case of the 6000-ft. rope is approximately 2½ times that existing in the 1500-ft. rope. The latter, when the full skip is at the bottom of the shaft, will be loaded to within, say, 45 tons of its breaking load, while the former retains a margin of about 110 tons." In this paper, it was also proved that the shocks due to jerks or sudden changes of velocity were, practically, only dangerous to a short rope, and that, after a depth of about 1500 ft. had been reached, the shock due to any specific change of velocity would remain constant.



CAGE IN USE AT MARCUS SHAFT

The commission was, however, unable to take full advantage of the results of this research and to advise a reduction of the minimum factor of safety for deep-level winding, because it was felt that there were other stresses in the rope that had been neither exactly determined nor proved to be independent of the depth of winding. The stress due to bending is probably the most important of these, and much experimental research is needed to discover how far the flexibility of the rope and, at the same time, the bending stress in its wires is influenced by the closer packing of these which the use of a lower factor of safety would involve.

A correct determination of the bending stress in the wires of a rope will be of the greatest value, and if this can be shown to be much less than it has been assessed by Professor Hrabak and other investigators, there will then be good reason to reconsider the decision now arrived at, that the minimum factor of safety of 6 shall be retained.

Evidence was given to the effect that hardship was caused by the present regulation which prescribes that, "in case a winding rope is used for other purposes besides the transport of persons, the maximum working load, when raising or lowering persons, shall not exceed 0.85 of the maximum load when the rope is in use for other purposes." In a deep-level shaft, the "maximum working load" consists so largely of the weight of the rope itself that when the above-mentioned rule is applied, it is found that an unnecessarily small number of persons may be carried in a conveyance of ample dimensions to accommodate more. The commission agrees with this contention, and recommends that this regulation be amended so as to make the limiting ratio —1 to 0.85—apply to the relation between the weight of conveyance and mineral contents to the weight of conveyance and persons.

Attaching the Rope to the Load

The method of making this attachment, commonly called the "Capping" of the rope, is a matter that merits close attention. The ideal capping should be at least as strong as the rope; it should be easily accessible for examination of the interior and should be easy to make. From the evidence brought before the commission, there appears to be great diversity of opinion as to whether a splice, coned socket, split socket or clips is the most satisfactory attachment. All these methods have their disadvantages. Some cappings are open to the objection that they screen off an important part of the rope from examination. With few exceptions, their efficiencies are very low as compared with the strength of the rope. Experiments have been made from time to time, both in England and other places, to determine their respective efficiencies by means of test. The Transvaal Mines Department has also made a special series of tests of the different methods of attachments in use on the Witwatersrand Mines. The results show that these vary from 71 up to 100 per cent. efficiency. The most variable results are obtained from the conical socket, in which the wires of the rope are opened out and turned back to form a cone which, more or less, fits the interior of the socket, the interstices being run up with some suitable white metal.

In the experiments with eight conical sockets, the lowest efficiency obtained was 71.12 per cent. while in three cases the rope itself broke quite clear of the attachment. A good deal of the variation is, doubtless, due to the difficulty of running in the metal in such a manner that it forms a solid cone with the wires. In some cases it is little more than so much packing, the result being that the strain comes on the wires that are bent round at the base of the socket, and this invariably makes them break at that point. Recently, in South Wales, a committee conducted a number of tests of this conical socket, and obtained efficiencies varying from 35.3 to 76.5 per cent. and averaging 56.9 per cent. for six cappings. The committee reported that: "The direct cause of giving way in all cases was the rupture of the wires at the place where they are doubled back to form the cone, and this appears to be the weakest point in our present method of capping."

If it is necessary, owing to the want of head room, to use this class of capping, which has the advantage of being very short, the best way to make it up is to leave the wires straight, and to clean and tin them before drawing down the socket over them. The next step is to pour in a white metal whose melting point is less than 500 deg. Fahrenheit.

Splices are satisfactory, both as regards their efficiency and the ease with which they can be examined, but it requires a skilled artisan to make them in a satisfactory manner. Unless a mine is sufficiently large to find constant employment for such a man, this method of capping presents difficulties.

Probably the most satisfactory method of attachment, where there is sufficient distance between the pit-head sheave and the point where the skip or cage is unloaded, is to use clips of an approved pattern. From experiments made, it is found that a clip of the "Crosby" type, which provides a good bearing surface, is to be preferred to others where the bearing area is little more than a series of points, and which, to get any grip on the rope, must damage it locally. The clips should be sufficient in number, say five spaced 1 ft. apart, for a rope 1⅛ in. diameter. The lowest clip should be close to the thimble or eye. It is a simple matter to connect the rope to the load in this way, and the exterior of the rope is easily accessible for examination. This cap also has the advantage of a high efficiency, about 90 per cent.

Safety Chains

There appears to be no doubt that safety chains are an advantage on a man-cage or skip, and are recommended These, as well as all other attachments should be made either of the best mild steel or the very best brand of iron (Low moor, Swedish charcoal, etc.). If made of iron, these attachments should be annealed at regular intervals. The factor of safety should be at least as high, and preferably higher, than that borne by the rope, on account of the shocks to which such attachments are subjected, which, in time, have a tendency to make the iron or steel brittle. For this reason, iron is to be preferred to steel for this service, as the annealing of the former is far more likely to be efficiently carried out. The commission does not recommend the use of a swivel connection between the rope and the load, except in the case of sinking, where an unguided conveyance, such as a kibble, is used for hoisting. A swivel has the effect of untwisting the rope and making the wires slack. It may be an advantage to let out of the rope that tendency to untwist which is due to the stretching effect of the load. In such a case, disconnect the load at the bottom of the shaft once or twice soon after a new rope has been put to work, and connect up again after the rope has stopped spinning.

A spring connection would probably minimize the shock on the rope where short ropes are used, but its use is not necessary in the case of a deep shaft on account of the great elasticity in the rope itself. If it is intended to fit any spring relief, the most practical method of doing this is to have the springs arranged in a frame under the plummer blocks that carry the pit-head sheaves. The blocks must only be allowed to move in synchronism, and not independently, as that would tilt the axle and sheave.

Safety-catch Tests

The tests of safety catches to stop cages in case of accident were conducted at the Marcus shaft of the Langlaagte Estate and Gold Mining Company. The accompanying sketches show the headgear at this shaft, and the cage to which the various attachments were made. The Marcus is a three-compartment shaft, 597 ft. deep, timbered with 8x8-in. pitch pine sets; it has one pump and ladder compartment, and two hauling compartments. The shaft is fitted with 4x4-in. guides, made of pitch pine. The headgear is of steel, 33 ft. high, and fitted with 8-ft. sheaves. It has a clearance up to the overwinding attachment plate of 27 ft. 5 in. from the surface. The distance from the headgear to center of arms of hauling engine is 90 ft. The hauling engine is of the double-cylinder geared type, with cylinders 18 in. diameter, and 28 in. stroke, working 8-ft. drums geared with a ratio of 3.7 to 1, steam pressure 90 lb. per square inch.

For the purpose of these tests, the drum shaft was fitted with a tachometer in order to ascertain the speed of hauling the rope. The cages used in the experiments were designed to accommodate a truck containing 1 ton of material, and fitted with safety catches of the ordinary eccentric toothed cam pattern actuated by four springs, and so arranged that when the rope is disconnected the springs immediately bring the eccentric cams against the sides of the guides, and the weight of the falling cage tends to force the teeth of the cams into the guides.

The results of the tests of safety catches, with descriptions of those tested, were summarized by Mr. Weston in the Engineering and Mining Journal of Nov. 2, last.

Use of Oxygen for Clearing Blast-furnace Tap-holes

By Robert Grimshaw*

The process invented by Dr. Menne, of Kreuztal in Westphalia, Germany, for clearing the tap holes of blast furnaces employs both hydrogen and compressed oxygen. The hydrogen is first turned on and when this gas is ignited, the ogygen control valve is opened. The pressure must be well throttled down until the iron is white hot. Then the pressure of the oxygen is raised until the cast iron commences to burn, which is indicated by strong sparking. The oxygen pressure is again raised, this time to about 450 lb. per sq. in., and the hydrogen shut off. From this point on, the fuel is iron, instead of hydrogen, and consequently there is a greater development of heat. Hydrogen and oxygen alone would not melt through the solidified mass, because the great volume of gases necessary would cause excessive loss of heat by radiation and conduction. Heat concentrated upon one point is required. For this reason iron which develops less heat per unit of weight, but takes up less room, replaces the hydrogen. One kilogram of hydrogen develops in combustion with oxygen about 13,057 calories, while the same weight of iron develops only 748. But a given weight of hydrogen takes up 87,234 times more room than the same weight of iron. Thus one volume of iron, burned in oxygen, develops $87{,}234 \times 748 \div 13{,}057 = 5012$ times as much heat as the same volume of hydrogen under the same conditions.

In burning the iron the heat developed is concentrated in a small space; and this accounts for the enormous temperature and the rapid action of the combustion on the frozen tap hole. The stream of gas not only melts the iron, but also blows it away from the hole. A slag hole or a tuyere opening a few centimeters in diameter may be freed from solid iron without injuring the walls, which are cooled by the action of the stream of gas under the high pressure employed. When hydrogen is not available, generator gas or ordinary illuminating gas may be used to start the operation.

*Engineer, Dresden, A, Germany.

Electric Power Plants on Upper Missouri River

Butte, Helena and Anaconda Receive Current at 70,000 Volts from a Plant Supplied by a Steel Dam at Hauser Lake

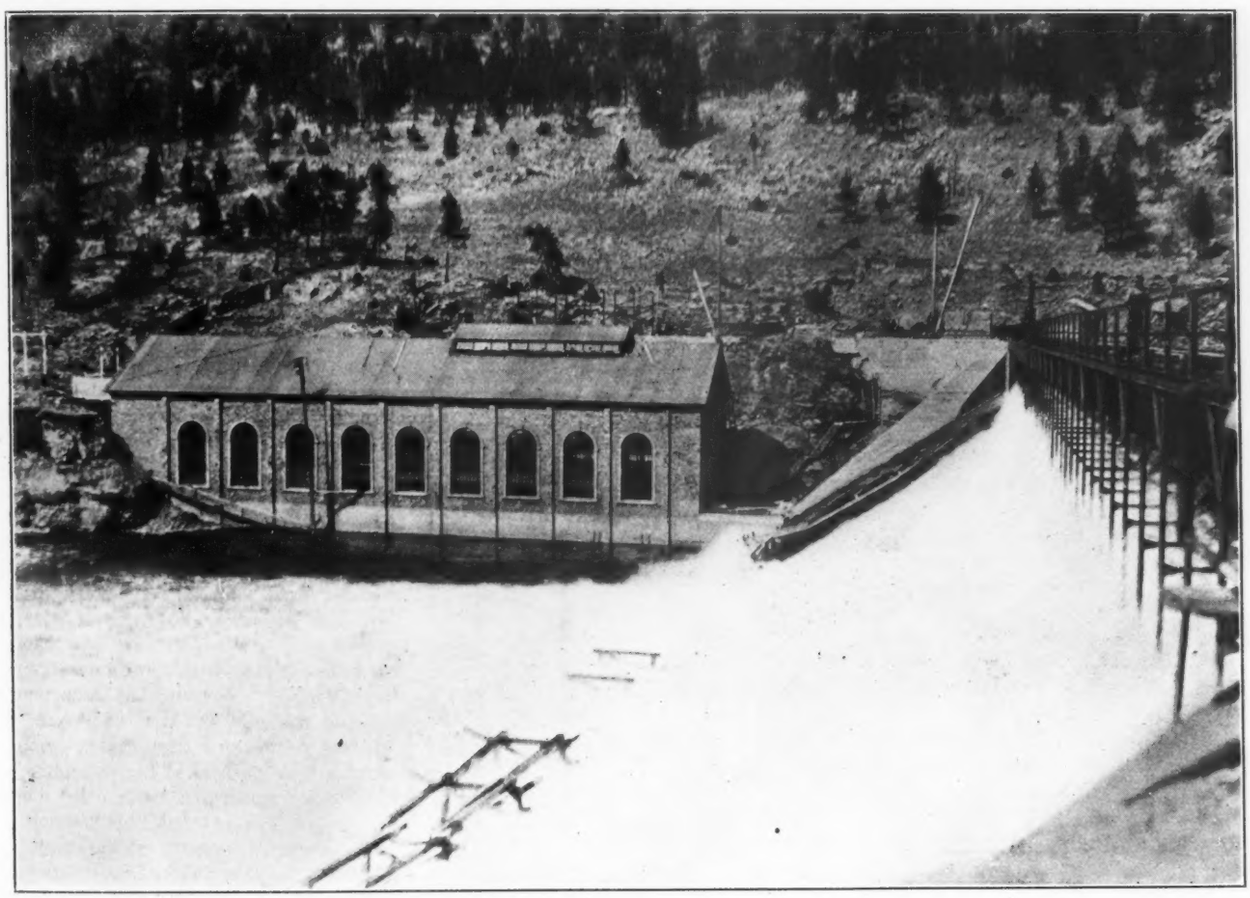
BY A. FLOYD BUSHNELL*

As long as twenty years ago, William Muth, H. M. Parcher, T. C. Power, A. J. Davidson and other Helena men, decided to build a plant for generating electric power on the Missouri river, and with this in view bought up property and water rights at what is now known as the Cañon Ferry dam and Lake Sewell. It was, however, not until eight years later that the first company, the Helena Light, Water and Power Company, was organized. This company built a dam of wood across the Missouri at Cañon Ferry and put in a plant of four 750-kw. generators, and transformers for stepping the voltage up to 11,000 volts, for transmission to Helena, 18 miles away, supplying en route the East Helena smelter, which at that time belonged to the Helena & Livingston Smelting and Reduction Company. This smelter was subsequently purchased by the American Smelting and Refining Company, but it is still supplied with power from the original installation at Cañon Ferry.

The enterprise proved so successful that a few years later it was decided to enlarge the plant. With this in view the Missouri River Power Company was organized. The new company undertook to transmit power to Butte, about 80 miles away, for use in the mines. Accordingly six additional 750-kw. generators were installed together with transformers aggregating 750 kw. Under the direction of M. H. Gerry the first line, using 50,000 volts, delta, was constructed from Cañon Ferry to Butte. The installation proved successful, and the voltage was increased, little by little, to 60,000 volts, using the original 50,000-volt installation. In completing this plant the waters of the Missouri were backed up about 18 miles, giving a fall at the dam of about 30 feet.

Helena Power Transmission Company

With electric power introduced at Butte, and a plant which could be depended upon for continuous service, the demand for current in the mines grew greater than the supply and it was deemed advisable to build another dam. With this in view the Helena Power Transmission Company was formed, which took over the old Missouri River Power Company, and in addition, in 1905, started work on a dam below the Cañon Ferry dam at what is now Hauser lake. Work on the dam was started in 1905 and completed in 1907 at a cost of approximately $12,000,000. The dam is of novel construction, being of steel throughout, with only enough concrete for foundation and end work. In the power house at this

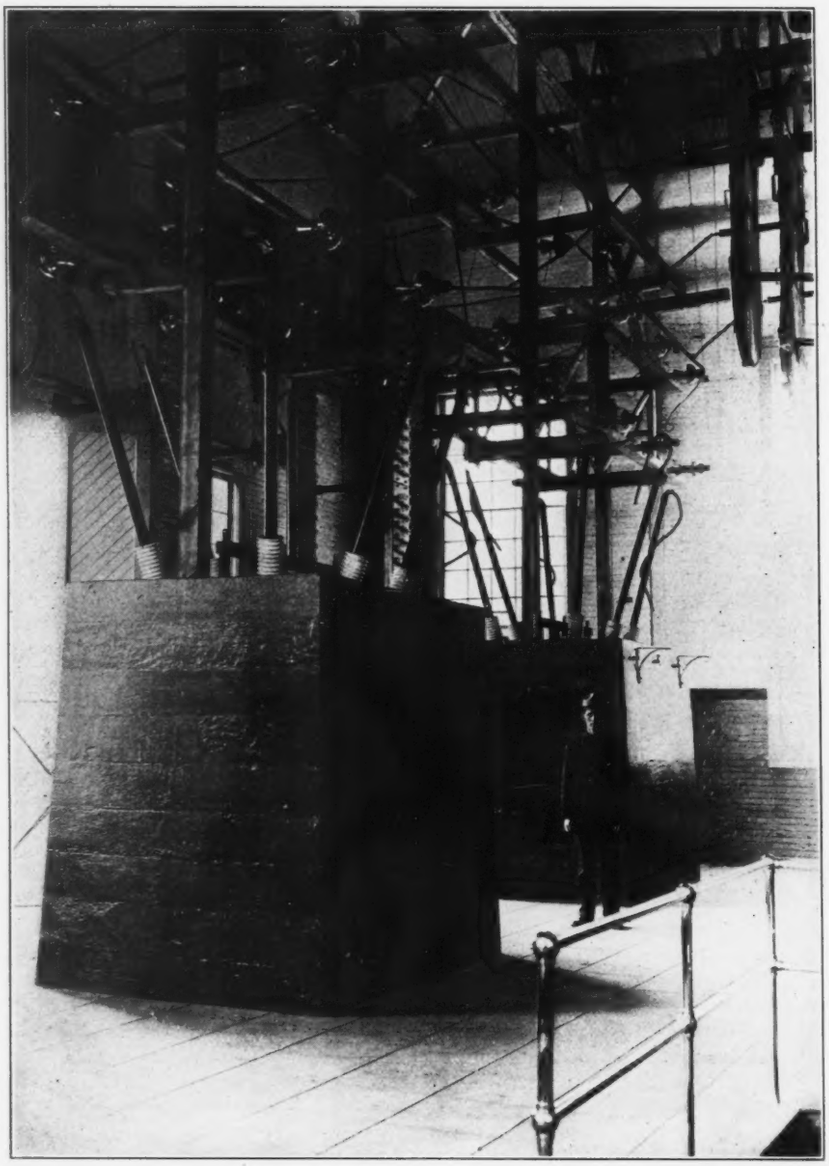


POWER HOUSE AND FALLS AT HAUSER LAKE

*Butte, Montana.

dam four 2800-kw. generating units are at present in operation, and a fifth, which will be running in a year, is about to be installed.

The power from Cañon Ferry and Hauser lake is carried over double lines to East Helena, there tied together and transmitted to Helena, Butte and Anaconda, the last named place being over 100 miles from the generating points.



88,000-VOLT HIGH TENSION TYPE L OIL SWITCHES FOR CONTROL OF HIGH TENSION LINES AT BUTTE SUBSTATION

Distribution

Butte is the main consumer, practically 16,000 h.p. being used to operate the mines in this camp. The Helena street railway, the smelters at East Helena and the Washoe smelter at Anaconda are other large consumers. The Amalgamated in Butte uses 10,000 h.p., the Red Metal Company 3000 h.p., the Clark properties 2000 h.p., La France Copper Company 1000 h.p. and the Amalgamated in Anaconda 5000 h.p. A combined steam auxiliary and transformer substation has been built in Butte; it is used as a distributing point. The equipment consists of two 2000-kw. Westinghouse-Parsons steam-turbine units; seven 1675-kw. transformers, and rotary converters and motor generating sets capable of delivering an aggregate of 600 h.p. in direct current.

The transformers operate from 70,000 volts, delta, and are connected in two banks of three in delta, with one transformer unit left over as a spare, which can be thrown in in place of any of the other six active transformers. Both the high-tension and low-tension currents are controlled by oil switches, electrically operated and arranged for distant control from a central switchboard. A storage battery floating across the bus-bars of the motor-driven exciters assures a supply of current for the generator fields, and for the operation of the oil switches. The entire station is laid out so as to assure absolutely continuous service.

The Hauser lake plant and the Butte substation were laid out with this continuity of service in view, and the switchboards include every new device for accomplishing this end. The switchboards are, however, compact, which is due largely to the fact that all switches are arranged for distant control from small master switches mounted on the switchboard.

The electrical installation at Cañon Ferry, Hauser lake, Butte and Anaconda was manufactured and installed by the Westinghouse Electric and Manufacturing Company. The water wheels at Hauser lake were furnished by the S. Morgan Smith Company, while the turbines as well as the mechanical stokers in the steam plant at Butte were furnished and erected by the Westinghouse Machine Company. The structural steel dam at Hauser lake was built by the Wisconsin Bridge and Iron Works.

Plant to be Built by United Missouri Company

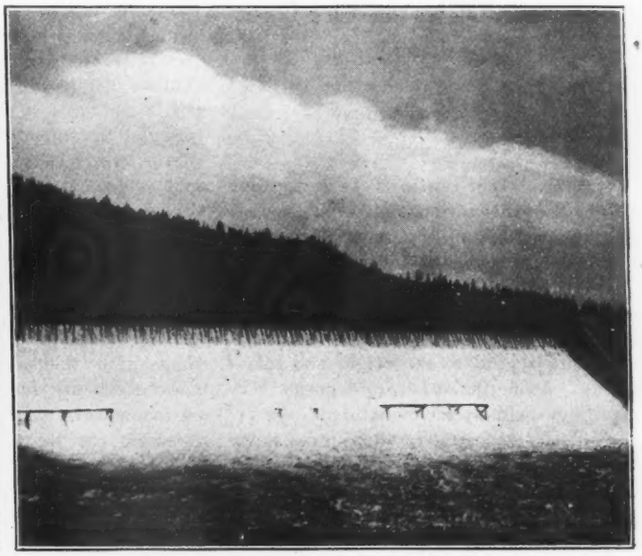
Preparations have recently been made for a 50,000-h.p. plant 23 miles below Hauser lake. The new plant, which will be as powerful as the other two combined, will be installed by the United Missouri Company.

The construction of these dams and power plants has been of great benefit to mining and other industries in Montana. The cost of generating one horse-power by steam is about $125 per year, while the power companies furnish the same amount of energy for $50. One mining operation which will directly feel the benefit of damming the stream is dredging for gold. Streams tributary to the Missouri, which were almost dry a greater part of the year, are now backed up sufficiently to enable the operation of large dredges. Nothing has as yet been done in this line, but it is considered an opening for future enterprise. Another benefit to be derived is the possibility of irrigating uncultivated lands. By means of the power generated it is possible to pump water to about 30,000 acres of waste lands in the Prickly Pear valley.

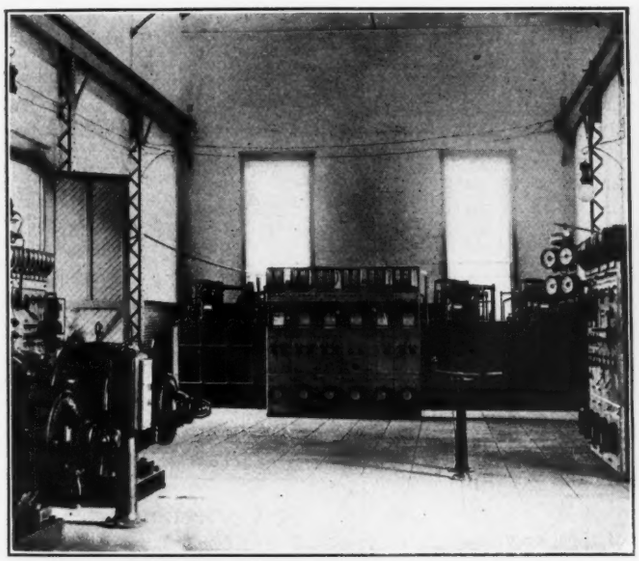
The author is indebted to G. B. Rosenblatt for technical information employed in the preparation of this article.

The induction furnace which is being used in the production of steel and ferroalloys is virtually a transformer in which the charge to be melted is a secondary of one turn. Since the heat due to the induced current is all developed directly in the charge itself without interposing radiating surfaces, this furnace is a smelting device of high efficiency.

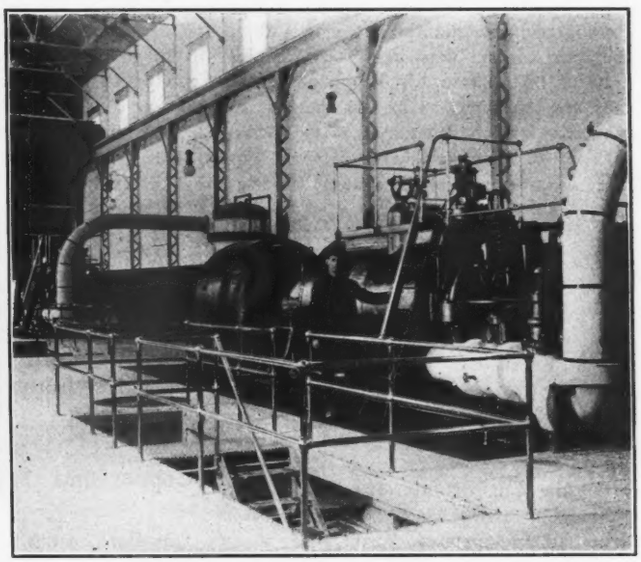
TOWN OF HAUSER LAKE



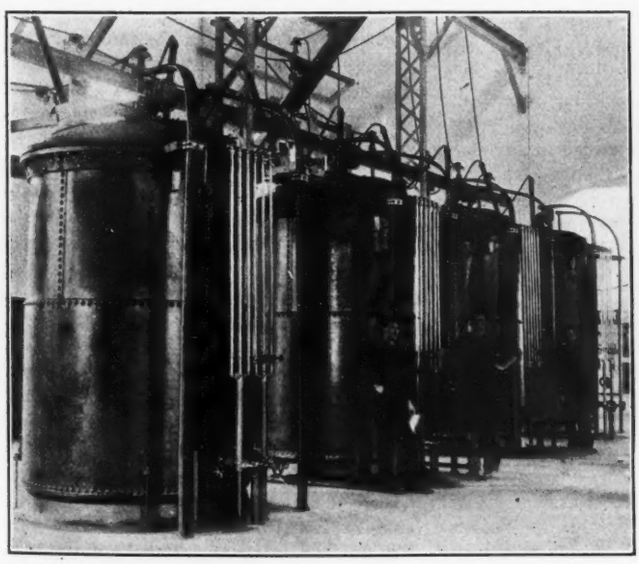
DAM AT HAUSER LAKE



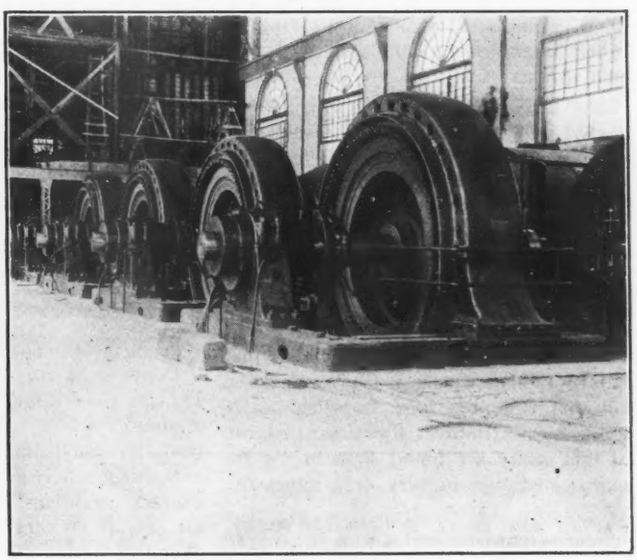
THE SWITCHBOARD AT BUTTE SUBSTATION



TWO TURBINE UNITS FROM SWITCHBOARD END AT BUTTE SUBSTATION



FOUR 1675-KW. OIL INSULATED WATER-COOLED TRANSFORMERS AT BUTTE



FOUR 280-KW. GENERATORS AT HAUSER LAKE

Modern Views on Ore Deposition*

By S. F. Emmons†

In more recent times, as the knowledge of ore deposits, through scientific studies, has increased, and the more theoretical questions with regard to them have become frequent subjects of discussion, many important changes have been brought about in the views generally held with regard to the origin and manner of formation of ore deposits. It has been actually demonstrated:

1. That deposits in limestone have been formed by directly ascending solutions, of which those of Rico, Colo., are the most notable instances.

2. That certain deposits in limestone have been formed primarily by direct emanations of mineral-bearing solutions from intruded igneous masses during cooling and consolidation, to which alone the term contact deposits is now considered to be scientifically applicable, since they are characterized by the presence of minerals formed during what is known as contact metamorphism. Up to 1901 there were no published scientific descriptions of such deposits in the United States, but since that time a vast number of important deposits, especially of copper, have been described as properly belonging to this type.

3. That certain deposits, especially of magnetic iron, have been actually formed by magmatic segregation from igneous masses during cooling and consolidation

4. That underground waters, which are still regarded as the most important vehicle for the transportation of vein material within the earth's crust, are not necessarily all of meteoric origin, as was formerly thought, but may rise from the squeezing out of occluded water from igneous magmas as they cool and contract. That such magmas are giving out water in sufficient quantity to feed thermal springs or to form ore deposits is of course not susceptible of direct proof It has long been recognized that during volcanic eruptions great quantities of the vapor of water escaped into the atmosphere, but this phenomenon has hitherto been explained as the result of the descent through fissures of ocean waters that came into contact with the rising magmas and thus produced extensive eruptions. Suess, the most prominent advocate of the modern theory, claims that it is not the ocean that feeds volcanoes, but that volcanoes have furnished water to the ocean. Indirect arguments in favor of this theory are found, first, in the observed fact that in very deep mines the lowest levels are relatively or absolutely dry; whence it is assumed that if surface waters do not reach such comparatively shallow depths they can hardly be supposed to have been the vehicle which brought the metals up from the barysphere, which must be fifty or a hundred fold as deep, or even to have reached any very deep-seated cooling magma. Second, European geologists, who have been making very long and thorough chemical studies of thermal waters, claim to be able to distinguish among them, by the relative permanence of their chemical composition and degree of saturation, those which are fed exclusively by cooling magmas, or what Suess calls juvenile waters, from those which are fed exclusively from meteoric waters, or vadose springs, or, again, those which are fed in part from one and in part from the other source.

5. Finally, it is generally admitted that the ores as now found in an ore deposit may be the result of a solution and reprecipitation many times repeated, each process resulting in a concentration of its metallic contents. Most important of these, from an economic view, is the secondary enrichment by surface waters. This was noted by the writer in his original report, as applied to the oxidized ores, but it was not then supposed to be possible chemically that it might go on below the ground-water level in the sulphide zone. This has recently been demonstrated, however, by actual laboratory experiments, and the action is recognized as the most important factor in forming the bonanzas of exceptionally rich deposits.

*From *Bull.* 320, U. S. Geological Survey, "Downtown District of Leadville, Colo.," by S. F. Emmons and J. D. Irving.

†Of the U. S. Geological Survey.

Copper and Tin in the Congo

The *Bulletin Officiel* of the Congo Free State says that prospecting has revealed the existence of copper deposits throughout a zone extending 200 miles east and west and 50 miles north and south in the district of Katanga. Development work has been undertaken only on about 12 of the many deposits which have been discovered and in no case has a depth of more than 40 m. been attained in any shaft. It is reported that more than 2,000,000 tons of copper ore have been revealed even by this small amount of development. The character of the deposits is such that most of them can be exploited by open cuts without the necessity of deep shafts or tunnels. The ore averages about 13 per cent. metallic copper.

Deposits of tin ore extend along the Lualaba river below the falls of Nsilo for a distance of 175 miles and explorations made so far point to the possibility of extracting a considerable quantity. The existing conditions in the Katanga district are said to be very favorable for the exploitation of the mines, the climate being agreeable, the altitude fairly high and the district as a whole temperate, healthful and well adapted to colonization. Numerous water falls existing on the rivers offer hydraulic power for use in the treatment of ores.

Thus far the only drawback to work is the lack of adequate transportation facilities which may be improved in a comparatively short time. A Belgium royal decree of June 3, 1906, authorized the increase of the public debt to the extent of 150,000,000 francs for the construction of a railway extending from Stanley pool to the Katanga district and another branch from this district to meet the Portuguese line which is now being constructed inland from the west coast of Africa.

Wages in British Columbia

Special Correspondence

The members of the Miners' union at Rossland and of the Smeltermen's union at Trail, B. C., have decided, by more than the two-thirds vote required, to accept lower wages than have been paid at those places since last July. The reduced rate at Rossland will be $3.75 for miners working eight hours per day, and $3 for trammers and shovelers.

The moving cause of this voluntary acceptance of lower wages is the general understanding that the larger companies would not continue their operations under the existing conditions of high wages and high cost of materials, with lower market values for metals. The reduction of labor costs will help to meet the situation without any general shut-down of mines and smelters in the Kootenay district.

A Correction

In the article entitled "Dredging Beach-gravel Deposits near Nome," in the Journal of Nov. 23, a stenographic error is responsible for the statement that centrifugal pump dredges were tried on the beach where the sand and fine gravel seemed particularly "unsuitable" for working in this way. What the author, J. P. Hutchins, intended to say was that the beach deposit seemed particularly "suitable" for working with dredges of this kind.

The Elmore vacuum process is being tested experimentally at the works of the Empire Zinc Company at Canyon City, Colo. An Elmore plant has just been installed at the Marion mine at Ilse, Colo. The Union Copper Company is putting one in at its copper mine in North Carolina. A plant for experimental purposes has been shipped to Ely, Nev. The outlook is that this process will receive extensive trial in cases where both the ore and the method are suited to each other.

The Silica Sand Industry

By Beverley S. Randolph*

In the last few years the production of silica sand for various purposes has advanced from an insignificant business, confined to a few scattering establishments, until now it involves large investments of capital. The establishments producing it range from the small pit with the simplest form of plasterer's screen to the large plant, equipped with elaborate quarrying, crushing and washing machinery. The recent expansion in concrete construction has been largely responsible for the increased output of the cheaper grades.

Sources of Supply

In districts near the seaboard, the demand for these cheaper grades is readily met from littoral beds and from recent formations which have not yet become indurated. By the use of steam-driven apparatus large quantities of this sand are produced at a very low cost. There are, however, extensive interior areas over which no such deposits are available, and where the only sources of reasonably pure silica sand are the rocks of the older formations. Where these beds are undisturbed, as in the upper Mississippi valley, the rock can be frequently separated easily into its original grains and requires little crushing. An example of this is the St. Peter sandstone, an extensive bed of very pure sandstone, underlying a large part of Illinois, Missouri and adjoining States but outcropping at comparatively few points. Throughout the region of the Appalachian folding the rocks are all more or less indurated and the available points for the economic production of sand are only found where the process of weathering has leached out the cementing matrix to such an extent as to permit the ready separation of the original grains.

Such areas are comparatively rare, since the region has been subjected to extensive denudation and the sandstones, being the most resistant rocks, generally occupy the more exposed positions, resulting in a prompt wearing away of their substance as soon as the cohesion is weakened by weathering. The larger bodies of workable stone are, therefore, found well above the level of the groundwater, where the position of the beds and the topographic and other conditions are such that the surface waters penetrate readily through the mass and flow off at a lower level; and where, at the same time, the outcrop is not exposed to excessive denudation. For this reason beds extending over a complete arch, while they may show excellent surface indications, will rarely be found to have been weathered to any depth, since the descending surface waters follow the stratification and flow off to each side. Monoclinal ridges, owing to the greater accessibility to surface waters, are found to be more deeply weathered.

Economic Considerations

While the demand for the lower grades of sand is large and rapidly growing, the sources of supply are so numerous and generally distributed that the profit to be obtained from its production is small and it is only by handling a considerable tonnage that money is to be made. The profitable portion of the business is found in the production of the higher grades of pure silica, for glass making and other purposes where almost absolute freedom from impurities is required. This presupposes an exceedingly pure material; but it must in all cases be washed since, while the original grains may be absolutely pure silica there is always some impurity, usually alumina, present, which must be washed out. For this purpose, more than for the production of the lower grades, it is necessary that the rock be readily separable into grains of moderate size, say 0.02 in. diameter. Silica in a more finely divided state has a tendency to float, which makes it impossible to prevent its being carried away in the waste water with the impurities.

Many quartzites are sufficiently free from impurities to indicate their use for the production of the highest grade of sand, but when crushed so large a percentage of fine powder is produced, which floats off with the water, that the resulting loss prevents the economical production. Considerable money has been lost by the installation of plants in disregard of this fact.

Practically all the sand of this class produced in the United States comes from three geological horizons. In the Mississippi Valley, the St. Peter sandstone, above mentioned, of the Cambrian; in Pennsylvania, West Virginia and Maryland, the Oriskany of the Devonian; in the Berkshire Hills of Massachusetts, the Cheshire quartzite, also of the Cambrian.

The St. Peter Sandstone

The St. Peter sandstone lies practically horizontal and is 100 ft. thick or more. It underlies a large area of the upper Mississippi valley, but even where it originally formed the exposed country rock it is now heavily covered with glacial drift, so that it is only accessible where the river valleys have cut down to it

QUARRIES AND WASHERIES OF THE WEST VIRGINIA & PENNSYLVANIA SAND COMPANY, NEAR BERKELEY SPRINGS, WEST VIRGINIA

The hill to the left is a monoclinal ridge of Oriskany sandstone dipping toward the washery. It is practically straight, though distorted in the photograph.

*Mine superintendent, Berkeley Springs, West Virginia.

through the drift. It is worked along the Fox and Illinois rivers in Illinois and in Missouri west of St. Louis. It is so soft that it breaks down almost completely with blasting, little or no crushing being needed and in places is excavated by the hydraulic method. The grains are rounded, indicating little change since the bed was laid down. An average of 10 per cent. will be retained on a screen of 40 meshes to the inch, 40 per cent. on 60-mesh and the remainder on a 100-mesh screen. Selected quarry samples analyze over 99 per cent. silica.

The washing process is simple, consisting in most cases of leaching in bins with one or more waters, though in some cases pans with rotary stirrers are used.

This district supplies the middle and western States with the better grades of sand and, owing to its cheaper production, is able to come well into the Ohio valley in competition with the sands from the eastern States.

The Oriskany Sandstone

In Pennsylvania, Maryland and West Virginia the Oriskany sandstone is the only source of the best grade of sand. This is due principally to its position with reference to the Helderberg limestone which it immediately overlies. When, in the process of erosion, a breach is made in an arch of Oriskany sandstone, the ease with which the underlying limestone is eroded results in a rapid destruction of the arch and the formation of long monoclinal ridges, in which the limestone is more or less penetrated by water channels, furnishing excellent drainage for the overlying sandstone. The Medina sandstone in this region is usually a very pure quartzite and is exposed over large areas; but as the underlying beds are difficult of erosion, it maintains its full arch over the anticlinal axes, even in the face of breaches where streams have cut through the arch from side to side.

The difficulties involved in preparing the rocks of this district for market are much greater than in the district first described. The rock is frequently quite hard and in many quarries large bodies of the original unchanged quartzite are found which cannot be crushed, but which must be moved out of the way of the workmen.

Preparation for Market

In the standard installation for preparing the sand of this district the material is first passed through a Blake or other form of pressure crusher, from which it is washed into a muller where it is ground in water. From this it passes to a series of inclined troughs, similar to a log washer, and operated by spiral elevators. In ascending each trough it is met by a descending stream of fresh water. After passing this it is allowed to drain for 24 hours and is then ready for the drier. Two forms of drier are used, the rotary, of which the Cummer drier is a type, and a stationary drier in which the sand is allowed to run between heated pipes.

After it is once crushed the material can readily be handled by various forms of belt, bucket or other conveyers. In the best modern plants it is handled by machinery entirely after it is loaded in the small cars in the quarry.

The accompanying illustration shows a typical plant for the preparation of sand for market. The hill to the left is a monoclinal ridge of Oriskany sandstone, dipping toward the washery. The plant shown is that of the West Virginia & Pennsylvania Sand Company, near Berkeley Springs, W. Va.

The New England Deposits

The shipments from the Berkshire hills of Massachusetts cut little figure in the market at the present time, owing to the fact that in the manufacture of the glass the fuel is the largest item of expense. This causes the factories to gravitate to the neighborhood of the cheap fuels which abound in the neighborhood of the central and western deposits.

A New Standard Oil Refinery

According to the New York daily papers, the Standard Oil Company has begun the erection of a new refinery in New Jersey, which will be the largest in the world, one section of it covering almost 1000 acres. It will be built in sections. The first, which will contain stills for turning out 20,000 bbl. of refined oil daily, will be completed before July next.

Ground for the erection of the first section of the plant was broken a few days ago, and within a few weeks 2500 laborers, bricklayers, and iron workers will be employed. The new plant will be erected between Elizabeth and the shore of the Staten Island sound.

The company now employs 71,000 men, but will be compelled to engage 1200 more to work in the first section of the new plant as soon as this is completed. For the first section contracts have been awarded for supplying 15,000 tons of iron platework, 16,000 tons of sand, 18,000 tons of broken stone, and 8,000,000 brick.

The company also intends to install new trunk pipe lines, so that branch refineries in every part of the United States may be supplied directly with crude oil.

Other plans are under way, it is said, which in time may result in bringing the center of the oil industry of the world to New Jersey, where the Standard Oil Company is incorporated. As a result of these plans many of the subsidiary oil corporations controlled by the Standard may be dissolved.

Steel Rail Specifications

The new specifications adopted by the Carnegie Steel Company Nov. 1, to govern contracts for steel rails, cover chemical composition as follows:

Sections.	Range in Per Cent.		Limit in Per Cent.	
	Carbon.	Manganese.	Phosphorus.	Silicon.
50 to 60 lb....	0.35 to 0.45	0.70 to 1.0	0.10	0.20
61 to 70 lb....	0.35 to 0.45	0.70 to 1.0	0.10	0.20
71 to 80 lb....	0.40 to 0.50	0.75 to 1.05	0.10	0.20
81 to 90 lb....	0.43 to 0.53	0.80 to 1.10	0.10	0.20
91 to 100 lb....	0.45 to 0.55	0.84 to 1.14	0.10	0.20

As to shrinkage, it is provided that the number of passes and speed of train shall be so regulated that, on leaving the rolls at the final pass, the temperature of rails of sections 75 lb. per yard and heavier will not exceed that which requires a shrinkage allowance at the hot saws of 67/16 in. for a 33-ft. 75-lb. rail, with an increase of 1/16 in. for each increase of 5 lb. in the weight of the section.

No artificial means of cooling the steel shall be used after the rails leave the rolls, nor shall they be held before sawing for the purpose of reducing their temperature.

Publicity in Corporation Affairs

According to Berlin despatches, says the New York *Times*, the German Government has adopted the reports of the United States Steel Corporation as a text book to be used in the technical schools. This is flattering to the corporation itself, and some regard it as a helpful influence in the campaign which has been waged for complete publicity for corporations. The Steel Corporation adopted the policy of publicity right at the outset and has continued it, aiming to make its reports sufficiently simple and detailed to be useful to its stockholders. Not all the reports that are published can be commended in the matter of explicitness, and while on their face they are perfectly frank, many items are difficult to analyze, and for that reason the effectiveness of the report is limited. From the point of view of the speculative game, the no report policy is a better one, inasmuch as speculation thrives on mystery.

In welding by means of the oxy-acetylene blow-pipe the point of the flame is held 1 to 0.25 in. from the work. No fluxes are required for iron, steel and copper, but for brasses and bronzes a little borax or boracic acid moistened with water is used for the purpose of preventing the volatilized zinc from being deposited on the point and thus preventing a weld.

Sounding a Difficult Piece of River

By Hiram W. Hixon*

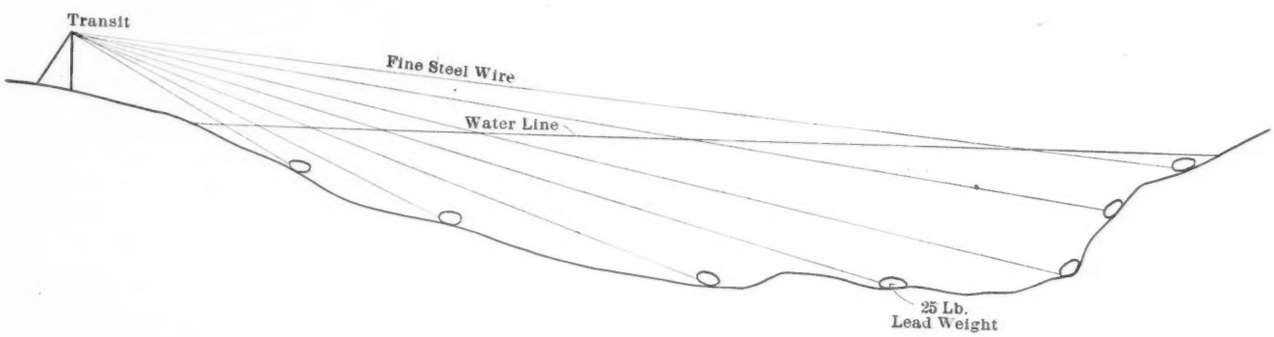
In making a survey for a water power development at the Wabegeshik chute on Vermillion river, it became necessary to take soundings for cross-sections of the bottom of the river. The dam could not be located, or estimates of the cost made, until these cross-sections were known.

The bottom of the river at this point is in solid rock and the dam was to be located at the top of a long rapid at the bottom of which is a fall of about 30 ft. The first section was taken from a boat about 100 ft. above the head of the rapid. This section showed 13 ft. depth of water, while it was apparent that at the head of the rapids the depth was not more than 5 feet.

A boat could not be held in the rapids, and even if it could no man could be found who was reckless enough to take the soundings from it. To overcome the difficulty, I designed a method for taking the cross-sections in the rapids which is described below and illustrated by the accompanying sketch, which is nearly self-explanatory. A fine steel wire such as is used for binding armatures of electric motors was attached to a 25-lb. lead weight. The total length of the wire was measured and a transit set upon the bank close to the waters edge. The lead weight with the wire attached was taken across the river above the rapid, the transit-man retaining the loose end. The weight was put into the water in line with the transit on the cross-section desired and the wire drawn taut. The vertical angle of the wire was read by the transit-man sighting at the point where the wire cut the surface of the water.

The length of wire from the axis of the telescope to the lead weight was determined by deducting from the total length of the wire the portion back of the transit. As this was on the land side it could be easily measured. The lead weight was pulled across the river bottom and readings of its position taken as often as desired. These readings were plotted to scale and the cross-section of the bottom of the river determined as accurately as necessary for the purpose without any danger of a man being swept over the falls and without much expense. It may be that this method has been used previously, but if it has it will do no harm to show how it can be done.

*General manager, the Mond Nickel Company, Ltd., Victoria Mines, Ontario, Canada.



CROSS-SECTION SHOWING METHOD OF SOUNDING

Peruvian Petroleum Fields

Details concerning the exploitation of Peruvian petroleum deposits and the production of marketable substances therefrom are given in the *Petroleum Review* (Oct. 26, 1907). The oil region is located on the narrow strip of land between the Andes mountains and the Pacific ocean. This strip is so narrow that at high tides the waves wash over it. Railroad iron is used as piling and driven into the sand as a foundation and protection for the derricks. This surface ocean sand is anywhere from 5 to 50 ft. in depth.

Drilling is done with a standard rig and the hole started inside a 12-in. casing. This casing drops down as the sand is drilled out. At the bottom of this sand a 10-in. casing is inserted and continued down to shut off the first salt water. Next 8-in. casing is used, then 6-in., then 4½-in. and finally 3-in. If they fail to get oil with the latter the hole is abandoned. It is necessary, on account of the soft formation, to use casing all the way down. The wells vary in depth from 180 to 1760 ft. The producing formation is not a sand, being either soft dirt or large pebbles. The wells are not shot; all of the producing wells flow naturally and some of the deep ones have a sufficient pressure to flow through the casing.

There is a small amount of gas and the oil is remarkably heavy. When it is pumped from a well it may be shoveled into a bucket and carried to the boilers for fuel. There is no railroad at Callao, the oil being sent on tank steamers to Zorritos, 600 miles north of Callao. The wells are pumped with a kerosene engine. Tubing and packing similar to those used in the Pennsylvania field are employed.

F. C. Piaggio & Co. have been in the petroleum business for 35 years and is the largest concern in Peru producing petroleum; two other large producers are the London Pacific and the Peruvian Corporation. The Piaggio company is reported to have 100 wells producing 150 bbl. daily, and the oil compares favorably with the California product. It has an asphalt base and about 30 per cent. is refined into more volatile oils. The refinery at Zorritos is equipped with stills, storage facilities, cooper shop and canning plant.

Losses in Air Pipes

Special Correspondence

A valuable series of papers, which have attracted much attention on the Rand, appeared recently in *South African Mines* on "Underground Air Pipes: Sizes and Capacities." The author states that £100,000 is annually wasted in Transvaal mines, because the underground air pipe lines are too small for the service required of them.

Before the commission now sitting in Johannesburg, many miners have stated that the laws regulating working air pressure in the mines of the Rand have much to do with the inefficiency charged against compressed air machinery. Besides the leaks in the air columns, the pressure is reduced by employing pipes too small in diameter to carry the air. As a result of the papers referred to, many of the mines on the Rand are investigating their air-pipes both on the surface and underground, and the drop of pressure between the compressor and the different working faces in the mine has surprised many mining men.

This unsatisfactory air pressure probably accounts for the apparent failure on the Rand of such air drills as the water-Leyner, which require high pressures for successful operation. If a reform comes about in the air pressures, and air is delivered at the working faces as high in pressure as in some parts of America. it is possible the Leyner drill might yet prove as splendid a machine on the Rand, as it is known to be in the States.

Petroleum Locations on Public Lands

The Los Angeles Chamber of Mines has been active in urging better regulations for the location of petroleum claims on public lands, and has been invited to submit an outline of the changes it desires to Mr. Woodruff, acting secretary of the Department of the Interior. At present locations are made under the placer law and it is in the provisions of this law that the changes are desired. The recommendation is that 160 acres of ground be considered a petroleum claim, that only this amount of land be open to a single individual, and under the requirement that active drilling for oil begin within 90 days from making the location, that drilling be diligently continued until a discovery of oil be made, that after the oil be found, application for deed to the land from the Government under the present regulations be allowed.

The obvious intent of these recommendations is to protect the prospector in holding a claim while conducting his operations, rendering him secure from having his territory usurped by homesteaders or mineral claimants before actual discovery of oil. Under present regulations discovery must be made before location can be claimed. Another provision which the chamber would like to have adopted is that a prospector be permitted to pay $1 per acre rent on his holdings in place of doing actual development and shall be protected in his holdings during this period, which, however, must not extend over a year.

The Mount Lyell Mine

SPECIAL CORRESPONDENCE

Cable advices from Melbourne give an outline of the results of the working for the half-year ended Sept. 30 by the Mount Lyell Mining and Railway Company. The ore treated was as follows: From Mount Lyell mine, 140,976 tons; from North Mount Lyell, 61,423 tons; total, 202,399 tons, averaging 2.32 per cent. copper, 1.72 oz. silver and 0.045 oz. gold per ton; also 10,544 tons of metal-bearing fluxes and 332 tons of purchased ore. The total production was 4143 tons blister copper, containing 4090 tons of fine copper, 344,715 oz. silver and 9334 oz. gold. After making full allowance for depreciation, taxes, and exploration expenses, a net profit was made of £128,728. A dividend absorbing £120,000 has been declared. The cost of producing blister copper was $3.704 per ton of ore, being 24.46c. higher than in the previous half year.

The development of the mines at depth is proceeding in a very satisfactory manner. The orebody at the 850-ft. level is as large and valuable as it is at the 700-ft. level and its appearance is such as to lead the engineers to believe that it will be met at the 1000-ft. level. The ore reserves at the Mount Lyell mine consist of over 3,500,000 tons, running rather over 0.5 per cent. copper, 2 oz. silver and 0.03 oz. gold. The North Mount Lyell mine, including Lyell Tharsis, contains reserves of 438,020 tons, averaging 5.75 per cent. copper, 1.33 oz. silver and 0.005 oz. gold; this is a considerable increase in the quantity during the half year. The fall in the price of copper has decreased the profits during the period, compared with those of a year ago.

Fluorine and the Precipitation of Alumina

The influence of fluorine and its compounds in affecting the precipitation of aluminum as hydroxide is considered by F. W. Hinrichsen in *Contributions* from the Imperial Society of Testing Materials, Germany (Vol. 25, 1907, p. 136). The presence of fluorine causes material amounts of aluminum to be held in solution when precipitation is attempted and may prevent the precipitation altogether. With increasing alumina, the amount of fluorine combined with alumina, presumably as aluminum fluoride, also increases. When aluminum is precipitated by means of ammonia under these conditions, ammonium fluoride is formed which acts upon the aluminum hydrate according to the equation $Al(OH)_3 + 3NH_4F = AlF_3 + 3NH_4(OH)$. The investigation of this reaction by using the law of mass action is made difficult by the formation of a double salt $(NH_4)_3\,AlF_6$. The precipitation of aluminum hydroxide by ammonia after evaporation with sulphuric and hydrofluoric acids will be quantitative only when the solution is evaporated to dryness and the residue heated strongly in order to convert the aluminum fluoride into oxide.

Testing Cement Limestone

BY ROBERT GRIMSHAW*

An approximative estimate of the value of the raw material for cement manufacture may be obtained by a method suggested by A. Gawalowski. The following articles are necessary: A glass vessel of 200 cc. capacity, with proper scale on the side, and a thick, long-necked bottle holding 0.2 liter, having on the neck a scale marked with cubic centimeters; a hand balance with suitable weights, a dish or a coffee cup; about ¼ liter of saturated solution of common salt; ¼ liter of hydrochloric acid mixed with a solution of common salt in the proportion of two to one.

*Dresden-A, Germany.

A sample of the limestone, pulverized with a hammer, and weighing 0.25 decigram is wrapped in a piece of tissue paper. The measuring cylinder or the bottle is filled flush with the brim with the hydrochloric acid; the solution of cooking salt is placed in the dish or coffee cup, and the cylinder is held over the measuring vessel, the mouth of which is first closed with a cork or the thumb, with the neck downward, in the solution of cooking salt. The fore and middle fingers of the right hand are then crossed, the cigarette-like paper cartridge is taken between these and placed rapidly under the mouth of the measuring-vessel. Gas will commence to be evolved. (The cartridge will usually rise in the measuring glass.) As soon as the action is finished, which takes at the most one to two hours, and usually only 15 minutes, the gas is read off in cubic centimeters. The number of cubic centimeters of $CO_2 \times 0.68 \times 10$ will give, nearly enough for practical purposes, the amount of carbonate present in the sample.

Length of Service to Determine Miners' Pay

A plan to adjust the wage-scale according to the length of an employee's service, recently submitted by the miners employed in the imperial quicksilver mines at Idria, Austria, is described in the *Montan-Zeitung* (Sept. 15, 1907). The miners proposed to divide all workmen into four classes of two divisions each, a man's membership in a class to depend solely on the length of time he has worked at the mines. Thus the first division of class 1 would consist of those who have worked continuously for 35 years, and the members of this class would receive the highest rate of pay. Those who have worked 30 years would belong to the second division of class 1, at a little lower rate of pay; and so on by five-year graduations to class 4. The first division of this class would consist of men of five years' service, and the second division of those who have worked less than five years. If the scale is adopted, all the miners are to be promoted on Jan. 1, 1908, to the class next above their present one.

The day's pay is based on an eight-hour day with 25 per cent. increase if 10 hours' work is demanded. A feature of payment which may seem odd to American miners is that wages are divided into two fixed parts, one of which must be paid in cash; but it is optional whether the second part shall be paid in cash or trade, the trade consisting usually of food supplies or wood.

According to the *Brass World* iridium will not alloy with gold on account of its high melting point, but remains in the metal in the form of hard white shot.

A New Oilfield in the Caucasus

According to press despatches, Dec. 6, a new oil gusher has been opened at Surakhant, 10 miles from Baku. This indicates an important extension of the Baku oil industry. The new well gives 10,000 bbl. a day. It is located on the site of an ancient temple, dedicated at one time to fire worship, and it is now supposed that the "eternal flames" that burned at the altar of the temple were maintained by natural gas issuing from the ground. This discovery is believed to open up a possibility of tapping an oil stratum in a region 40 times larger than the present one. The new stratum includes part of the bed of the Caspian sea, and takes in the so-called "Sacred Isle," where Zoroaster, about 400 years before Christ, preached the fire cult.

Dangerous Occupations

By A. H. Wethey*

Much of our current literature deals with the dangers of men employed in various kinds of large industrial enterprises throughout the country. These articles are frequently written with the apparent desire of creating the impression that corporations conduct their enterprises without any care or thought of the employees, and they are calculated to destroy the good feeling and harmony which should exist between the employer and the employee. I think it is beyond question that all manufacturing enterprises bear in mind the fact that it is to their interest to secure their employees from accidents which may result in their injury or death. In all industrial employment there is more or less risk incident to the business, which cannot be avoided. After all, human life is a series of struggles from the cradle to the grave, and in whatever walk of life a man is situated we never can tell when some unforeseen accident may overtake him.

There have probably been more deaths by accidents among wealthy people using automobiles in the past year than have occurred among the employees of some large industrial concerns like the Illinois Steel Company; and the proportion of deaths to the numbers engaged in the two pursuits would show a much larger percentage among the automobilists. Sometimes the number of accidents in a large concern is compared to the number of fatalities occurring on the battlefield. The fact that a battle may last only one day, whereas the employees of a manufacturing concern may work 300 days in the year, is not thought of. If 10,000 men work an average of 300 days a year it would be like a battle in which 3,000,000 contestants were engaged, and if only 40 or 50 of these men were killed it would appear that the percentage of loss of the men engaged was very trifling.

It is true that the employees in many plants, even if they see something that requires repair or change and that if not changed may cause some accident, are afraid to mention the fact for fear that they would be called kickers and discharged. Men who are engaged day by day in some dangerous employment, if they are observant, are perhaps able to suggest some device that would lessen the risk of their employment and yet are afraid to speak of it.

In our establishment I adopted a form some months ago which has worked very satisfactorily. The form is as follows:

THIS INFORMATION IS DESIRED SOLELY FOR THE PURPOSE OF PROMOTING THE HEALTH AND SAFETY OF THE EMPLOYEES.

BUTTE REDUCTION WORKS.

Butte, Montana.....

1. State your name.....
2. State your address.....
3. When did you enter the employ of the company?.....
4. What is your nationality?.....
5. Do you understand the English language?.....
6. Do you know that electric wires are dangerous?.....
7. What is your occupation?.....
8. Under what foreman do you work?.....
9. Do you know the dangers incident to your occupation?.....
10. Can you suggest any practical changes or improvements to reduce the dangers of your occupation?.....
11. Are there any dangers, or dangerous places, where you work?.....
12. If the place where you work is unsafe, please suggest what should be done to make it more safe?.....

It is the earnest desire of the management to reduce the risk of accident to its employees to a minimum. They are warned that electric wires, either insulated or bare, are equally dangerous.

Employees are warned not to pass through the elevator shafts. They are requested to notify the management at any time of any point that appears dangerous.

(Signature of Employee).....

I hereby certify that I have fully explained to the above mentioned employee the meaning of the foregoing information, and I have warned him to use due care in the exercise of his work.

.....

Foreman or Timekeeper.

All our old employees signed these forms without hesitation and many of them made valuable practical suggestions that have been carried out. The form is in triplicate, the original being filed in the main office, the duplicate being kept at the works and the triplicate retained by the employee signing it. When new men are engaged they sign the form and they are warned to be careful. Where foreigners are employed the form is explained to the employee before it is signed, and the interpreter's name is also signed as witnessing the signature and stating that he has made a complete explanation of the form to the employee.

*General manager for W. A. Clark, Butte, Mont.

Ontario Mining Law

A meeting of the Canadian Mining Institute, Toronto branch, was held in Toronto, Ont., Nov. 19, Eugene Coste in the chair. The object was to consider proposed amendments to the Ontario mining law. It was urged that the laws were intricate, confusing and subject to the frequent enactment of regulations by order-in-council. The subject of mining-claim inspection was discussed at length. It was urged that the provision making the passing of a claim by an inspector necessary before development could be proceeded with, which had originally been enacted to prevent the blanketing of large areas, had failed of its purpose, as that practice was pursued extensively by prospectors acting under powers of attorney. A resolution moved by J. B. Tyrrell disapproving of inspection until such time as the inspector is called on by the prospector to make it, and declaring that the prospector should be allowed to remain on the ground as long as he is willing to work the claim, was adopted. A motion favoring the abolition of the mining license was lost. The question of the mining tax was considered. A recommendation prepared by a committee of the Mining Institute strongly opposing the present royalty was laid on the table, as being merely of a negative character. It was the sense of the meeting that as the provincial government had definitely laid down the policy of taxing the mining industry, it was useless to reiterate objections already urged without effect, and that what should be done was to advance constructive suggestions as to a form of taxation which would be more equitable and less objectionable than a royalty. A committee to prepare a measure along these lines for submission to the Government was appointed, consisting of Eugene Coste, J. B Tyrrell, Frank C. Loring, C. Adler and J. C. Murray.

During the last 50 years of mining in Great Britain the yearly number of fatal accidents has not varied very much, keeping around an average of 1100 accidents per year. In this time the number of miners employed has increased steadily from 200,000 in 1851 to over a million in 1906 so that the percentage of fatal accidents has greatly diminished.

The Anthracite Mines at Alden, Penn.

Haulage Cost of Coal Per Ton-mile, Average Output Per Miner and Methods of Subduing a Mine Fire

BY M. S. HACHITA

The greater part of the hoisting of coal at the Alden mine is accomplished through No. 2 shaft. Only from 70 to 80 cars per day are hoisted up the No. 1 shaft, which is used for taking down supplies. The No. 1 shaft is heavily cribbed with 12x12-in. timber down to the bed rock, which is about 100 ft. from the surface. The head frame, which is of steel construction, is 40 ft. high and is bolted on to a concrete foundation. The sheave wheels are 12 ft. in diameter with cast-iron rims and hubs, while the spokes are wrought iron. The cages are the single-deck type, raising one car at each hoist. They are balanced, that is, while one is at the foot of the shaft the other is at the surface landing.

A 1⅝-in. cast-steel rope, composed of 6 strands and a hemp center, with 19 wires to the strand, is used for hoisting the cages. It has an ultimate tensile strength of 80 tons and is wound on a 10x12-ft. cylindrical drum driven by a 18x36-in. second-motion engine. The steam is conveyed to the engine house through an 8-in. pipe from the boiler house about 100 ft. east of the shaft. The boiler house, as is shown in Fig. 1, consists of four sets of finger water-tube boilers having 200 h.p. each. The fuel for these boilers is a mixture of rice and barley. About 40 tons of coal per 24 hours are required to maintain a pressure of 90 lb.

The fuel is brought from the washery to the firing room by means of a conveyer line. The fuel conveyer is constructed of double rows of 9-in. old I-beams, 12 in. apart and filled with sheet iron ¼ of an inch thick and bolted with countersunk stove bolts. Fig. 2 shows the hexagonal concrete reservoir, 2 ft. thick at the bottom and 16 in. at the top, with a capacity of 14,000 gal. Into this reservoir the exhaust steam from the engines, from the breaker, etc., pours and heats the water to the boiling point (212 deg. F.). The hot water thus obtained is fed into the boilers by a 7½x5x10-in. duplex plunger pump, through a 5-in. pipe. A force fan, driven by a 5x7-in. engine, is used to create the draft in the boiler grate. It is estimated that a saving of fuel of 20 per cent. is effected by means of the hot-water feed.

The No. 2 Shaft

The No. 2 shaft is located 1900 ft. north of No. 1 shaft. Its dimensions are 12x30 ft. It is divided into three compartments, two for hoisting and the third for an up-cast. It is 617 ft. deep to the Cooper seam, which is the present bottom, but preparations are now being made to extend to the Red Ash bed. When this extension is completed it will have a total depth of over 1200 ft. The construction of the head frame is similar to that of No. 1 shaft, but it is of more recent design. The sheave wheels are 12 ft. in diameter and the hoisting rope is 1⅝ in. in diameter. The No. 2 shaft engine is directly connected to the 13-ft. drum and is used for hoisting.

Air pumps and electric signals are used. The engine room and the principal parts of the mine are connected by telephone. Another boiler house is located at No. 2 shaft. It contains three sets of finger water-tube boilers and one set of Wilcox having 200 h.p. each.

Cost of Handling the Coal

About 400 cars of coal are hoisted up the No. 2 shaft and handled by a 2½-ton locomotive to the breaker near the No. 1 shaft. The haulage road has a grade of 2 3/10 per cent. in favor of the load. One engineer and one brakeman are employed in handling the cars. The cost per ton mile of handling the coal is as follows:

Engineer at	$2.25
1 brakeman	1.75
Fuel for locomotive	1.00
10 per cent. depreciation of locomotive and interest on investment	1.00
10 per cent. depreciation of road and interest on investment, oil, waste, grease, etc.	1.50
Total per day	$7.50
Length of haul	1900 ft.
Total haul per 9-hr. shift	1000 tons.

(1900 ÷ 5280) × 1000 = 360 tons; and 7.50 ÷ 300 = 0.0208 cost of net ton mile.

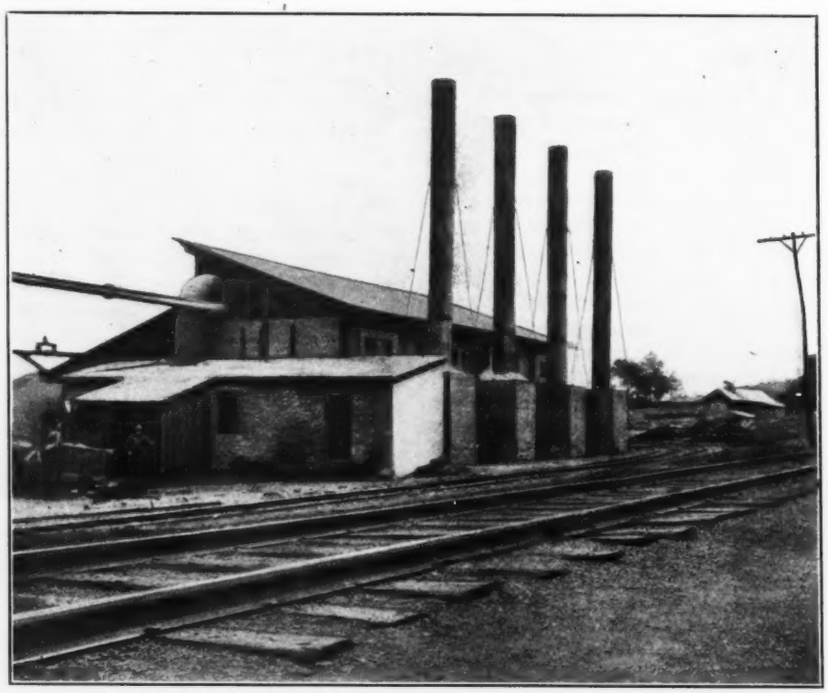


FIG. 1. BOILER HOUSE AT ALDEN MINE

The engine, as shown in Fig. 2, was designed and built by the Vulcan Iron Works, of Wilkes-Barre, Penn. It is a large machine, with cylinders widely separated (21 ft. center to center), so as to admit the two large drums, each of which has a winding capacity of 1300 ft. The capacity of the conical portion is 800 ft., while that of the cylindrical portion is 500 ft. The cylinders are 30 in. in diameter and have a stroke of 48 in. The drums are loose on the shaft, which latter is 15 in. in diameter. The brakes have a 12-in. friction surface and are operated by steam. Steam is fed into the engine through an 8-in. pipe, the exhaust steam pipe is 10 in., with an 8x10-in. throttle.

Fig. 3 is a view of the breaker to which all coal is delivered. The raw coal is hoisted to the top of the breaker by a 14x18-in. engine geared to an 8-ft. cylindrical drum. Fig. 6 shows the process of preparing coal for the market.

Average Output per Man

The company employs 140 miners to produce the coal; the average output per miner per day is 8.38 tons. There are five fire bosses, four for the day shift and one for the night shift. All workings are inspected before the miners are permitted to go down the shafts. The blacksmith's shop is situated just south of the breaker. It is 60 ft. long and 40 ft. wide and is built of corrugated sheet iron with a slate-covered roof. The equipment of the shop consists of one lathe, one drill press, sheet-iron cutter, band saw, circular saw and a Curtis-Curtis pipe cutter. All these machines are driven by an 8x16-in. engine. The building is lighted by acetylene gas.

Acetylene Gas Used for Lighting

A little west of the blacksmith shop there is a general warehouse 40x60 ft. In this building is kept a complete assortment of stock. It is heated by steam and lighted by acetylene gas, which is made in a little out-house where the gas generator is installed. This apparatus is automatically operated so that whenever the gas is not in demand it is not generated.

The Saw Mill

The saw mill at the colliery is located back of the No. 2 shaft engine house. It is built of wood 60x20 ft. and consists of the following parts: One 60-in. saw, 60 teeth; one 52-in. saw 44 teeth; carriage, 40 in. x 24 ft.; timbers 5½x7½ in.; rack beams 36 ft.; six sets of 10-in. trucks; one 1/16-in. axle; babbited boxes; six track scrapers; double adjustable guides; board rollers; wheel spreader; variable friction feet; pulley 24x14 in.; saw collar 6¾ in.; 11-in. box chain; mandrel 2 5/16 in. x7 ft. for 2-in. saw hole; husk 9½ in. x 5 ft.; timbers 5½x11½ in.; two 49-in. ratchet head blocks; two duplex dogs; 20 ft. 2 3/16 in. set shaft; ratchet set works. The power for running the mill is furnished by a 10x24-in. engine, transmitted by an 8-ft. drive wheel through a 12-in. leather belt. The capacity of the mill is from 15,000 to 20,000 ft. per day of nine hours. About one-half the timber supply is furnished by the company property while the other half is bought from outside parties. Two men are usually employed in the mill.

A hand-power diamond-drilling outfit has been installed. The outside diameter of the bit is 1⅝ in. and the total length of the rod is 300 ft. Occasional prospecting is done with this machine.

The Office and Company Houses

The general office building contains the offices of the general manager, secretary and treasurer, superintendent, engineer and shipping clerks. The rooms are comfortably furnished and lighted by electricity.

The company owns nearly 100 dwelling houses for miners. Each house has from four to eight rooms according to whether it is a single or double house. Each house is occupied by from one to three families, according to the size of the family. The workmen are well treated, and the best of feeling prevails among the employees. There were 712 names on the pay roll last month, 500 men and boys employed inside and 212 on the outside, including the office men.

A Serious Mine Fire

Through the carelessness of a miner in 1898, a serious mine fire occurred near the foot of No. 2 shaft. A complete account of the fire, written by K. M. Smith, general manager of the company, appeared in the Worcester Polytechnic *Journal*, but a brief description of the method used in dealing with this fire may be of some interest. On the 25th of January, 1898, while a miner was handling dynamite in a heavily timbered portion of an airway in the Cooper vein, the timber caught fire and in a short time the fire was beyond control, notwithstanding water at hand. Heavy gas explosions followed, destroying stops, brattices, etc.; consequently ventilation was suspended. Soon after the explosions the gas began to accumulate rapidly and it

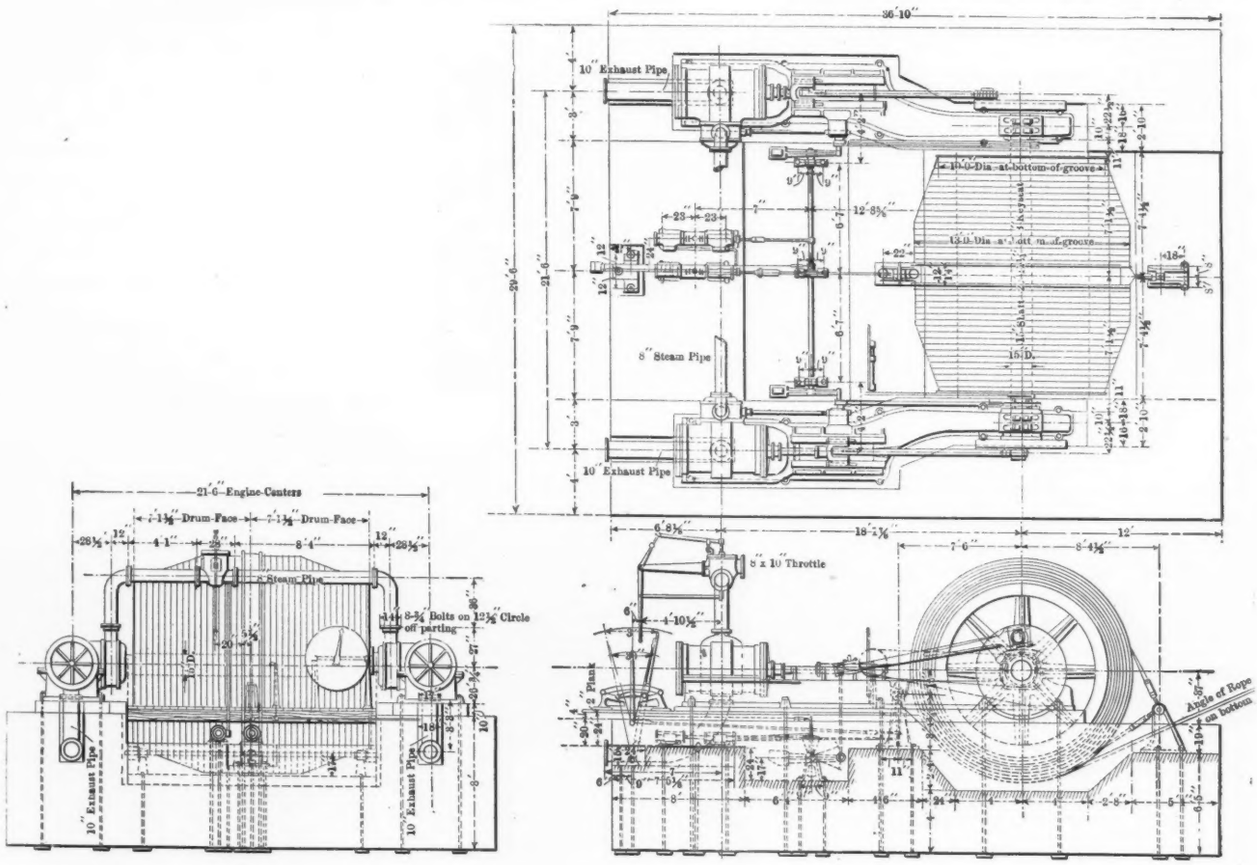


FIG. 2. 30X48-IN. ENGINES AND 13-FT. DRUM AT ALDEN COAL COMPANY'S PLANT

became impossible for men to work in the vicinity of the fire.

Preparations were at once made to flood the mine. A bore hole *C* (Fig. 5) was immediately drilled to connect the surface and the highest part of the workings near

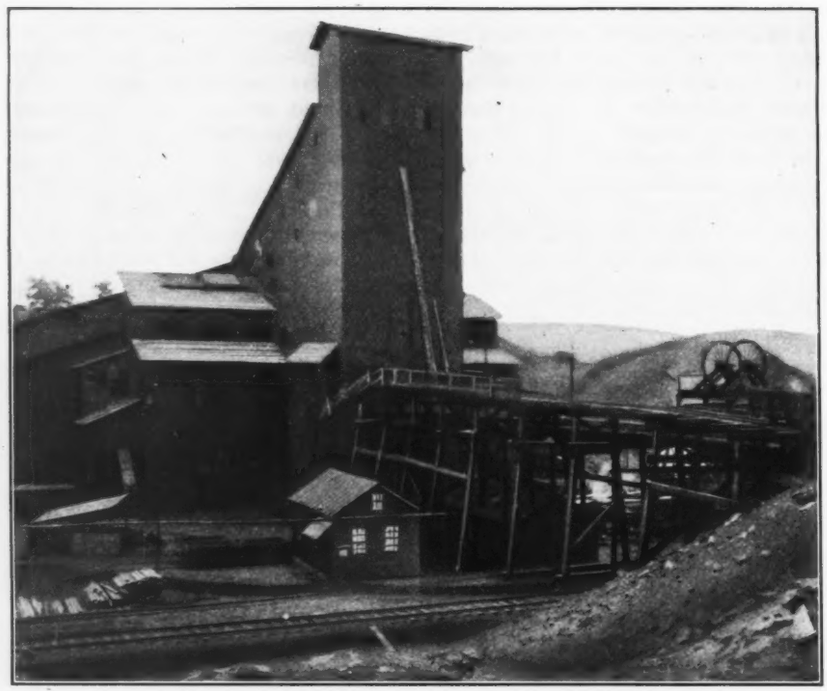


FIG. 3. ALDEN COAL COMPANY BREAKER

the fire and thus tap the fire damp. Large pumps were soon placed near the creek and the construction of a dam in the tunnel between No. 1 and No. 2 shafts was commenced so as to raise water over the area affected by the fire so that work might be resumed in the other part of the mine. The dam, 20 ft. long and 12 ft. high, was constructed of sawed timber and concrete. It was completed after six days' continuous work. This dam withstood a pressure of 3.13 tons per sq.ft. when the water reached a hight of 103 ft. which was at least 13 ft. above the foot of the bore hole. The pumps were then stopped. The estimated quantity of water thus pumped into the mine was 35,000,000 gal. The drill hole *C* had reached the vein by March 4. Water tanks made of wood and furnished with valves and gates for filling and discharging were constructed on the hoisting cages. The capacity of each tank was 2000 gal.

In the space of one month all the water was hoisted and the work of repairing the shaft was begun. On April 16 the ventilation was restored. Within 48 hours, steam and the products of combustion were noticed at the up cast, and these were soon followed by heavy explosions, showing that fire still existed in the mine. It was decided to flood the mine again. The water was pumped in and rose to the hight of 40 ft., at which hight the appearance of steam and explosions stopped.

The Cooper vein pitches about 20 deg. to the south in the neighborhood of No. 2 shaft; an opening 25 ft. from the foot of the shaft, was made from the shaft to the airway *A* (Fig. 5). The object of this opening was to lower the water sufficiently to be able to get into the airway and ascertain the location and extent of the fire. Ventilation was completely suspended and the openings were filled with rock and fire damp. As the work of cleaning the debris advanced, a brattice was carried in, permitting only such quantity of air as was necessary for the men. Large volumes of gas were constantly flowing from the openings made in the face but were temporarily held in check by air dams built a few feet in advance of the men, who worked in the intake with Wolfe safety lamps.

Blasting was not permitted. The progress of the work was slow, as immense quantities of rock had been brought down by the fire. It took over two months' hard work to explore above this water level. The temperature was still high, but no fire existed, as had been expected. The remaining water was gradually removed in the early part of August and the entire area affected by the fire explored as described above. This was followed by the restoration of ventilation.

The tunnel and shaded part of the gangways and breasts, Fig. 5, had caved and fallen to the hight of 35 ft. Mining was finally resumed on the third of December. Examinations made after the fire showed that the gases, confined in the higher parts of the chambers, had taken an important part in extinguishing the fire.

The Vajen-Bader Head Protector

The Vajen-Bader head protector, manufactured at Richmond, Ind., and electric lamps, were used in exploring the mine while it was filled with fire damp. This protector is not in such general use in the anthracite field as it should be, so a brief description may be of interest. Fig. 4 shows the front and back view of the apparatus. It completely covers the head and fits tightly around the shoulders where its weight rests. It is made of fire- and water-proof materials. Fresh air is

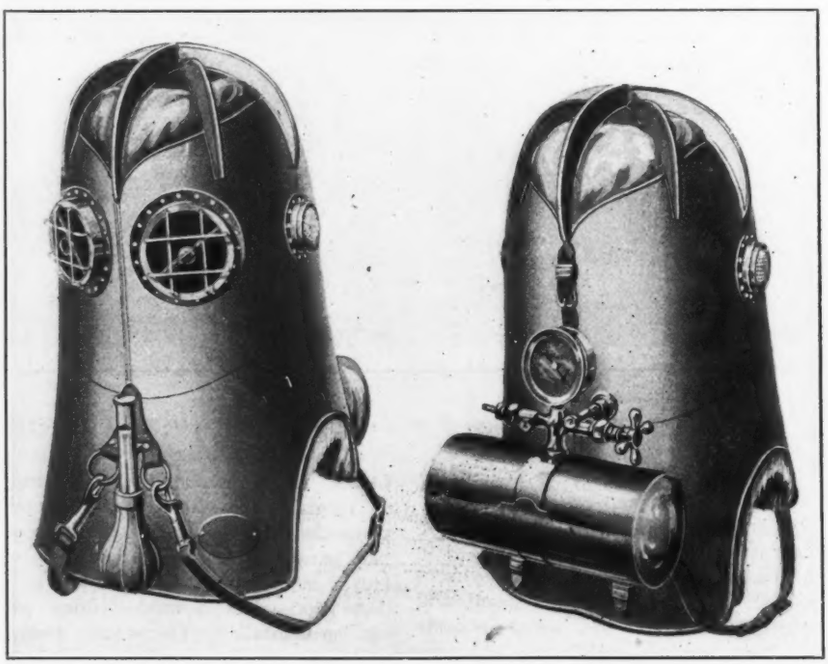


FIG. 4. THE VAJEN-BADER HEAD PROTECTOR

supplied to the wearer at the natural pressure from the reservoir fastened to the back of the helmet.

A gage is attached to the reservoir to indicate the amount of air contained. The reservoir can be filled by the air pump in less than two minutes. By opening the valve on the top of the reservoir, air is forced through the supply tube, which has an inside opening directly in front of the nostrils. This air in the reservoir is sufficient to make the wearer perfectly comfortable for one hour or longer. In the front of the helmet are two lookouts made of double plates of clear mica with revolving cleaners; each plate is protected by four cross wires. Ear pieces are attached to both sides so as to render the hearing perfectly distinct. A whistle attached in front is used for signaling purposes. The whole outfit weighs only six pounds. The apparatus does not require any chemicals, and wherever there is fresh air it can be charged and made ready for instant use.

There are not many individual operators in the anthracite field whose mines are as well equipped or who have introduced so many new ideas as the Alden Coal Company; or many operators, individual or otherwise, whose relations with their employees and the public are as harmonious as those maintained by this concern. It points with pride to its standing in the eyes of the public as manifested in the following clipping from the Wilkes-Barre *Record*: "There is one coal company that pays its just share of taxes. This is the Alden Coal Company. At today's investigation of the Grand Jury it was shown that this company pays about 40 per cent. more than any other company in the county."

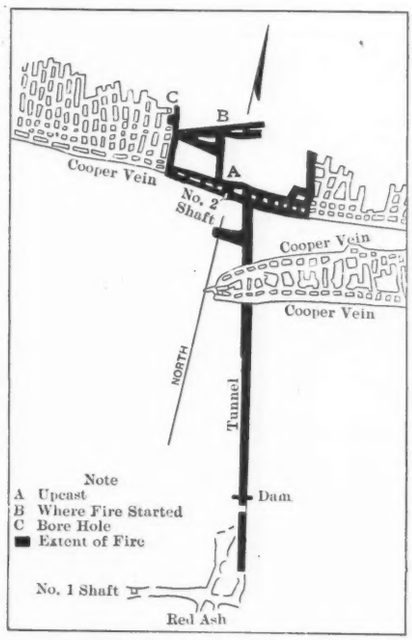


FIG. 5. MAP SHOWING LOCATION OF FIRE IN COOPER VEIN

Reinforced Concrete Beams

Bulletin No. 14, "Tests of Reinforced Concrete Beams, Series of 1906," has just been issued by the University of Illinois Engineering Experiment Station. The tests described are a continuation of the tests discussed in Bulletin No. 4. The topics investigated include the effect of quality of concrete upon the strength of beams, the effect of repeated loading upon the action of beams, and the resistance of beams to diagonal tension failures. The results of the investigation of diagonal tension failures throw light upon the amount of the vertical shearing stress which may be allowed in reinforced concrete beams not having metallic web reinforcement. The resistance of beams to diagonal tension may be the controlling feature of relatively short beams, and as such failures occur suddenly and without much warning a knowledge of the resistance of the concrete is essential. Some beams gave surprisingly low values, and it seems evident that the values allowed by many city building ordinances are higher than should be recommended. The tests of concrete columns and reinforced concrete columns, and of reinforced concrete T-beams for 1906 have already been published.

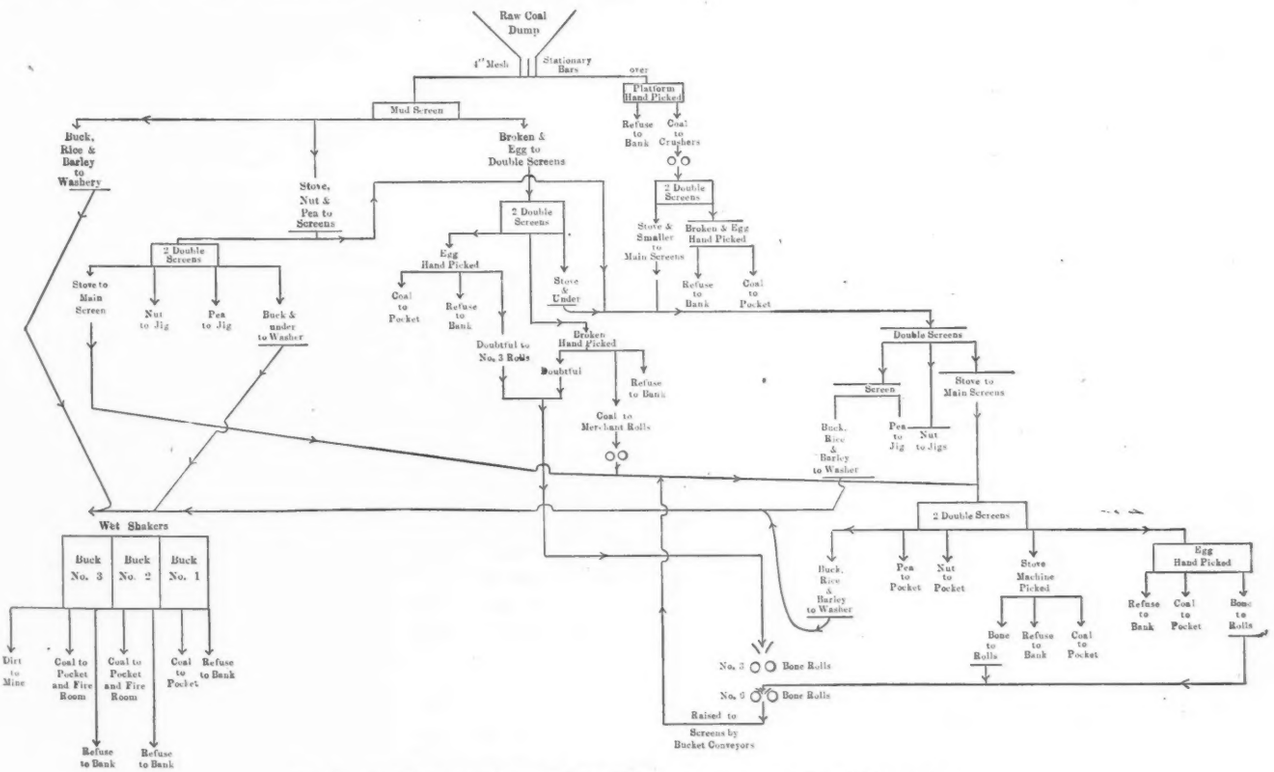


FIG. 6. DIAGRAM SHOWING PREPARATION OF COAL AT THE ALDEN PLANT

I am greatly indebted to K. M. Smith, general manager; F. Moon, secretary and treasurer; J. M. Turner, superintendent, and to U. S. Norton, engineer, for many courtesies and much information concerning the Alden plant.

Recent reports show that 150,000,000 tons of coal are used annually by the railways of the United States, out of which but 7,500,000 tons are used in drawing the trains, while 142,500,000 tons goes up the smoke stacks as waste.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

It has been shown that in firing black powder by electric current there is no advantage in using powerful detonators, for black powder cannot be detonated, but explodes in the same way as when a match or fuse fires it.

From observations made at the Hellon, Haswell and Tyne Main Collieries in England, it has been estimated that 13 parts out of 14 of the ventilating pressure were consumed by the friction of the airways, and only one part remained to be utilized in creating velocity at the upcast.

The pipes or radiators of a thawing house should be placed in one end of the room and should be encased in such a manner that it will not be possible for any one to put dynamite where it can touch these pipes, or where any drop of nitroglycerin, which might exude from the cartridges, can come in contact with the heated surfaces.

When driving a tunnel in hard sandstone the cut holes should be charged with 75 per cent. dynamite and the "trimming" holes with 40 per cent. dynamite. In softer rocks such as slate, shale, etc., 40 per cent. dynamite has been found effective for the cut holes. If mine managers and foremen would exercise proper judgment in regard to the hardness of the strata through which tunnelling is to be done, a considerable sum might be saved by using the most effective grade of explosives.

When the required dimensions of a tunnel are 8x7 ft. in the clear it is better to construct it 12x7 ft., so that the extra width of four feet is available in case the tunnel has to be timbered. It is often cheaper to drive a 12x7-ft. tunnel than to drive one of smaller dimensions 8x7 and afterward to increase the section. It is generally best when planning a tunnel to figure timbering in the plan. Generally speaking, one shift of four men can drill and fire 19 to 21 holes 10 to 12 ft. deep. These holes usually break 60 to 100 tons of rock.

In 1906, 984 men were killed in the coal mines of the United Kingdom, 48 per cent. of the deaths were due to falls of roof or coal, 29 per cent. to miscellaneous causes, 4.7 per cent. to explosions of fire damp and coal dust, and 6.4 per cent. to shaft accidents. Out of 143 total explosions, 128 were caused by naked lights, two by safety lamps, six by explosives, one by a mine fire and six by unknown causes. Nearly 90 per cent. of the explosions were directly chargeable to naked lights. The majority of these accidents could therefore have been avoided by the use of safety lights.

Timber in anthracite mines should vary from 14 to 18 in. in diameter when the roof is bad. The timbers should be spaced from 5 to 10 ft. apart. Miners driving gangways, or headings, usually have two laborers in the Wyoming coalfield. When no timbering is required, the progress of the gangway is at the rate of 4 to 5 ft. per 8 hours. If timbering is required the progress is from 3 to 4 ft. per shift. If the coal is hard and tough, without timbering, a miner can drive 3 ft. per day, if timbering is required his progress will hardly exceed 2½ ft. per day.

When a vein of coal is worked by the room and pillar system, one of the principal causes of the loss of coal in mining is that rooms are driven too wide and the pillars left to support the roof are too narrow, with the result that the coal in the pillars is crushed and lost before it is possible to rob the pillars. Experience shows that the initial cost of mining is cheaper if the rooms are driven wider, leaving narrow pillars, but in the end the total amount of coal thus won is small compared with the percentage of total recovery when wide pillars are left and then removed by robbing on the retreat.

One of the thickest beds of anthracite coal in the United States is found near Tamaqua, Penn. It is the Mammoth seam, 115 ft. thick. China has her Mammoth bed of coal at Hongay. The thickness of this deposit is 200 ft., 85 ft. thicker than the American seam. The Chinese Mammoth vein crops out along the hill and is usually mined by stripping in benches. The thickness of each bench is from 10 to 15 ft. so that there are 13 to 20 benches in the seam. Each bench produces from 50 to 75 tons per day or a total output of 1000 tons per day from the workings. The company employs 3500 natives in and about the mines, besides 50 European foremen.

At the Pelton colliery, in Great Britain, a drill hole was put down in the coal measures. The hole was carefully tubed so that the gas could not escape, and a gage was fixed at the outer end of the tube to note the pressure exerted by the gas. By this means a pressure of 912 lb. per sq.in. was noted. These observations were taken for a considerable length of time, also the variations in barometric pressure were recorded. It was found that when the atmospheric pressure was low, a great pressure of gas was recorded, which tends to show that the fire damp generated in a gassy mine is greatly influenced by atmospheric disturbances, the amount of gas generated being the inverse proportion to the atmospheric pressure.

In tempering steel drills great care must be taken not to burn them by applying too high a temperature. The sharpening should be done by striking the point lightly and quickly until it is quite black. In hardening a steel pick the end only should be heated to about one inch from the point and when cooled off the water should not reach more than ¾ in. above this point. When steel is heated and allowed to cool gradually it becomes soft, but if the temperature is reduced rapidly it will become very hard and brittle. The play of colors on a point that has been cooled slightly by water after reheating, should be carefully watched, and as soon as the right color is reached the point should be cooled rapidly in water. These colors vary from light yellow to brown, purple, violet, and dark blue. Each color represents a different degree of hardness.

Sinking a shaft is more expensive than driving a tunnel of equal cross-section. It is also impossible to sink a shaft as speedily as to drive a tunnel of the same size. The reason for slowness in shaft sinking lies in the fact that the greater portion of the muck must be removed after each blast before the drilling machine can be put up, whereas in tunneling the drillers can work while the muckers are busy. Timbering a shaft also delays the sinking. It is somewhat harder to ventilate a shaft than a tunnel. In dealing with water in a tunnel, it may be syphoned out or gravitated to the mouth of the tunnel, whereas in shaft sinking, every gallon of water must either be pumped or bailed out. The number of drill holes and the amount of charge used are practically the same in both shaft sinking and tunnel driving. One of the best records in shaft sinking was made in South Africa; a 6x21 ft. shaft was sunk 858 ft. in five months. In this shaft 4032 holes were drilled to an average depth of 7 ft. 2 in. Gelatin to the amount of 418 cases, 2475 coils of fuse and 86 boxes of detonators were used. In excavating one cubic yard of rock, the depth of drill holes equaled 7.23 ft.; the gelatin used equaled 0.1044 box, and the fuse equaled 0.0618 coil per cu.yd. of rock excavated. Detonators equalled 0.0212 box per cu.yd. of rock removed.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.

505 Pearl Street, New York.

London Office: 6 Bouverie Street, London E. C., Eng.

CABLE ADDRESS "ENGMINJOUR, N. Y."

Subscription, payable in advance, $5.00 a year of 52 numbers, including postage in the United States, Mexico Cuba, Porto Rico, Hawaii or the Philippines. $6.50 in Canada.

To Foreign Countries, including postage, $8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

During 1906 THE ENGINEERING AND MINING JOURNAL *printed and circulated* 462,500 *copies, an average of* 8896 *per issue. Of this issue,* 9500 *copies are printed. None sent regularly free. No back numbers beyond current year.*

Contents

	PAGE
Editorials:	
Statistics of Metal Production in 1906	1221
The Troops to Leave Goldfield	1221
Fixation of Nitrogen	1222
Protection of the Colliery Laborer	1222
Gold and Silver Production in the United States	1222
*Notes on Churn Drill Placer Prospecting.....*John Power Hutchins*	1197
*Mount Radiant, a New Zealand Copper Discovery.....*Sydney Fry*	1202
*Hoisting Ropes for Mines—IV. *U. P. Swinburne and Associates*	1203
Use of Oxygen for Clearing Blast-furnace Tap Holes..*Robert Grimshaw*	1206
*Electric Power Plants on Upper Missouri River.....*A. Floyd Bushnell*	1207
Modern Views on Ore Deposition. *S F. Emmons*	1210
Copper and Tin in the Congo	1210
Wages in British Columbia. *Special Correspondence*	1210
*The Silica Sand Industry. *Beverley S. Randolph*	1211
A New Standard Oil Refiner	1212
Steel Rail Specifications	1212
Publicity in Corporation Affairs	1212
*Sounding a Difficult Piece of River. *Hiram W. Hixon*	1213
Peruvian Petroleum Fields	1213
Losses in Air Pipe. *Special Correspondence*	1213
Petroleum Locations on Public Lands	1214
The Mount Lyell Mine. *Special Correspondence*	1214
Fluorine and the Precipitation of Alumina	1214
Testing Cement Limestone. *Robert Grimshaw*	1214
Length of Service to Determine Miners' Pay	1214
A New Oilfield in the Caucausus	1215
Dangerous Occupations...*A. H. Wethey*	1215
Ontario Mining Law	1215
*The Anthracite Mines at Alden, Penn. *M. S. Hachita*	1216
Colliery Notes	1220
Correspondence:	
Negative Results in Pyritic Smelting. *Clarence Grabill*	1223
The Monongah Disaster. *George S. Rice*	1224
The Wage Scale in Hopkins County, Kentucky.....*A. B. C.*	1225
Value of Molybdenite.....*P. B. B.*	1225
Determination of Antimony and Tin in Babbitt of Other Alloys	1225
Patents	1226
Troops to Leave Goldfield	1227
William Thomson, Lord Kelvin	1227
Personal, Obituary, Societies and Technical Schools	1228
Industrial, Trade Catalogs, Construction News	1229
Special Correspondence	1230
Mining News	1232
Markets, etc	1238

**Illustrated.*

Statistics of Metal Production in 1906

The final statistics of the Geological Survey for the production of copper, lead and spelter in 1906 have been published in press bulletins under dates of Dec. 16, and 23. A comparison between these statistics and those collected by, and previously published in, the JOURNAL and "The Mineral Industry" is interesting. Such a comparison is given in the following table:

	Min. Ind.	U. S. G. S.
Lead production, refined, tons	405,536	404,669
Antimonial lead, production, tons	10,120	10,546
Lead, grand total, tons	415,656	415,215
Lead production, domestic tons	355,309	350,153
Lead consumption, tons	380,122	376,300
Spelter production, tons	225,494	224,770
Spelter consumption, tons	222,477	221,781
Copper production, lb	917,620,000	917,805,682
Copper imports, lb	225,843,281	215,402,841
Copper exports, lb	467,839,041	446,750,711
Copper consumption, electrical, lb	.....	340,000,000
Copper consumption, for brass making, lb	228,000,000	210,000,000
Copper consumpt'n, sheet, lb	.....	35,000,000
Copper consumpt'n, castings, lb	.....	100,000,000
Copper consumpt'n, total	668,576,336	685,000,000
Copper, av. price of electrolytic	19.28c.	19.30c.
Copper, av. price of lake	19.62c.	19.55c.
Copper, world's production, lb	1,576,879,800	1,596,973,700

It will be observed that the agreement between the statistics, independently collected, is close, and is consequently a verification of the accuracy of each. In only a few cases is the difference more than 1 per cent. The differences in the figures for the imports and exports of copper are rather surprising, inasmuch as in each case they are obtained from the Bureau of Statistics of the Department of Commerce and Labor. However, that Bureau does not report the copper content of the ore and matte exported, which consequently has to be computed from other data and this opens the way to a certain difference in the total.

The statistics of the Geological Survey are tardy in appearing, but they are based upon exhaustive investigations and give many new details as to the production of these metals which are interesting and valuable. Among the interesting features are the statistics as to the production of copper ore. It is stated that the copper of domestic origin in 1906 was derived from approximately 19,743,000 tons of ore, which yielded an average of 2.15 per cent. copper, but the amount of copper ore proper was about 18,000,000 tons averaging 2.5 per cent. copper. Of the total tonnage (19,743,000) approximately 5,021,000 tons were smelted without concentration. The remaining 14,722, 000 tons were concentrating ores, from which were produced 2,985,000 tons of concentrate. These figures show the smelting of about 8,000,000 tons of ore. However, it is necessary to have the full report before any useful analysis of these figures can be made.

The Troops to Leave Goldfield

The President's order to withdraw the troops from Goldfield is to be regretted. His reason is that it is no part of the duty of the Federal Government to provide a substitute for the exercise by a State of its police functions, and the Government of Nevada manifests no intention to take the steps necessary in the matter. This raises constitutional questions that may be argued by the lawyers. The plain facts of the case are that citizens of Goldfield desired to exercise their constitutional rights over which a grave emergency promised to arise. The State of Nevada being unable to guarantee these rights, the Federal Government was asked to do so.

The State of Nevada has no organized militia to speak of, and if it wanted to organize a force to exercise its proper police functions, much time would be required to do so. And what if the legislature did not desire to do so? Are citizens of the United States to be deprived of their right to conduct their business as they see fit, of course in compliance with the law? They have been deprived of that right at Goldfield and will continue to be if protection be withdrawn.

The police function consists first in preserving order; next in restoring it if things have passed temporarily out of hand. The President's letters to Governor Sparks seem to imply resentment because there has been no trouble at Goldfield and the feeling that aid was improperly asked. On the contrary, the President should be proud that his prompt action prevented any disorder. Did anyone suppose that the members of the local union of the Western Federation of Miners would be otherwise than lamb-like when the commission of crimes would be promptly checked with every prospect of punishment?

If the operators of Goldfield desire to employ non-union men they have the right to do so. If non-union men desire to work for the operators they have the

right to do so. The practical question is to insure those rights. We uphold the operators of Goldfield in their desire to secure their legitimate rights. We do not uphold them in their intention to introduce the card system. The members of labor unions also have rights, although ore stealing and assassination are not among them. The duty of the Government is to see that the rights of all citizens may be freely exercised.

Fixation of Nitrogen

When Lord Kelvin visited this country a few years ago the enterprise which he considered the most important and most promising among the many American industries that he studied was represented by a small apparatus at Niagara Falls for the manufacture of nitrate from atmospheric air. It was a mere box or chamber in which a current of air was subjected to the action of a series of electric sparks emitted by a number of knobs on a rapidly revolving drum. The electric spark caused the nitrogen and the oxygen in the air to unite, thus serving as a basis for supplying plants with nitrogenous foods without drawing upon the stores in the earth. The industry has not grown to conspicuous proportions in this country since Lord Kelvin's visit, but in Norway electric energy representing more than 40,000 h.p. is regularly producing calcium nitrate and plans are under way to utilize 250,000 h.p. more for the same purpose.

A permanent supply of nitrogenous compounds to replace the stores withdrawn from the ground by growing plants has long been regarded as a necessity. In 1898 Sir William Crookes predicted that the world could not continue to produce the breadstuffs it required unless some way were found to restore the nitrogen of the soil. He stated that the beds of Chilean saltpeter were only a temporary resource. Within the last few years agricultural science has made remarkable progress in restoring nitrogen to impoverished soils by means of nitrogen-collecting crops and also by inoculation with bacterial cultures. Still, nitrate will continue to be an important part of commercial fertilizers, and the metallurgical and chemical industries will require increasing supplies of nitrogenous raw material in several lines of active development. The fact that it is now commercially possible to utilize the inexhaustible supply of nitrogen everywhere available in the air may prove to rank in importance with the discovery of the bessemer process and the art of making aniline dyes from coal tar.

The manufacture of calcium nitrate from atmospheric nitrogen on a commercial scale began at Nottoden, Norway, where 2000 h.p. produced about 1000 tons of nitrate per year. When the success of this small plant was demonstrated a larger works employing 40,000 h.p. supplied by the Tinfos waterfall was erected. This plant began operations on Sept. 1 of the present year. The Norwegian Storthing some time ago authorized the construction of a dam at the Rjukanfos, one of the greatest waterfalls of the country, and to erect a power plant to develop 250,000 h.p. for nitrate manufacture.

The industry which now seems to be fairly established depends upon no local deposits of raw material. It will flourish wherever a sufficiently cheap source of power is available. The problems involved are essentially those of electric power production. Even questions of transportation and labor supply are of secondary importance.

Protection of the Colliery Laborer

A matter which is assuming serious proportions in the anthracite regions and which will soon demand attention from the authorities is the treatment of the ignorant mine laborer by his employer, the miner. The miner and his helper are commonly both foreigners and of the same nationality, the laborer being usually the later arrival and more helpless in his ignorance of the language and the customs of the country. The miner has learned that he can swindle his helper with little danger of trouble to himself by reporting less time than is due the laborer and pocketing the difference. The laborer is referred to the paymaster for the adjustment of his troubles and the dispute is passed along to the mine foreman who, being unable to understand the language, gives the laborer little satisfaction. The miner explains to his bewildered helper that some official of the company is pocketing his earnings, and there is no one to set the matter right. At some collieries not a pay-day passes without more or less trouble from this cause.

It is difficult for the laborer to get redress in the courts, and he ends by placing the blame upon the company, in which he is not entirely wrong. Surely the company cannot deny all responsibilities for matters subject to its own regulation. Formerly when the miner paid his laborer directly, there was comparatively little trouble, for under that arrangement the miner could not shirk responsibility, and the laborer could understand his status, which was simple. The laborer is entitled to his wages, and he is rarely so ignorant that he cannot understand when he has been robbed. It will not improve his temper and his attitude toward the company and the authorities if they through negligence or indifference permit him to be exploited by his associates.

Gold and Silver Production in the United States

In reporting the revised statistics of the production of gold and silver in the United States, in our issue of Oct. 26, credit for these figures was erroneously given to the Bureau of the Mint alone, which has heretofore been responsible for them. However, the figures for 1906 were the result of conference and adjustment between the Bureau of the Mint and the Geological Survey, and are accepted as final by the two bureaus. The totals were arrived at from data collected by the Bureau of the Mint showing bullion deposited in the United States Mint and Assay Offices, and from statements received by that Bureau from smelting and refining establishments. The distribution by States was checked and verified by data collected directly by the Geological Survey from the producing mines. It is gratifying to know that these two statistical bureaus are now working in such complete harmony, which cannot fail to be to the general advantage.

SINGULAR INTEREST IS excited by the fact that the De Beers company which controls the diamond output of South Africa, last week passed its semi-annual dividend, whereas it paid 35 per cent.at this time in 1906. According to the New York *Evening Post's* despatches, this action is avowedly based on the company's belief in prolonged depression in America, and a consequent slump in the diamond trade. Importations of precious stones and pearls into New York during November showed a decrease of $1,800,000 as compared with the same month last year. The importations were lighter than in any corresponding month since 1898.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Negative Results in Pyritic Smelting

In the JOURNAL of Nov. 2 there is an article by Lewis T. Wright in which he attempts to show by an approximate heat balance sheet for an assumed charge the impossibility of the successful outcome of certain experiments by G. F. Beardsley on the pyritic smelting of a certain nickel-copper pyrrhotite ore.

I think he is mistaken in his conclusions, and the importance attached to his article leads me to call attention to one important error and possibly several minor ones. The main error is so essential to the second part of his argument that when corrected the results obtained completely reverse the figures given and the conclusions to be drawn, as Mr. Wright will, without doubt, acknowledge as soon as his attention is called to the matter.

PLUS OR MINUS SIGNS

The error lies in the fundamental equation of the second part of his article, which he gives as follows:

$$FeS + 3\ Fe_2O_3 = 7\ FeO + SO_2\ [+23.8 + 3\ (199.4) - 7\ (66.4) - 71] = 85.2\ \text{cal.},$$

This reaction as always runs from left to right. The heat units on the left side have already been dissipated and must be replaced by those of the right side. Consequently the signs should be reversed; where he has used minus he should use plus and *vice versa*, giving as a result (correcting a minor numerical error) —86.2 cal. instead of +85.2 or —2.69 cal. per lb. sulphur involved instead of +2.66 cal. That is, instead of a heat development of 26.60 cal. with which he credits the roasted ore charge he should debit it with a heat absorption of 26.9 cal.

Tabulating his figures as originally given we have for the quantities involved:

HEAT QUANTITIES INVOLVED BY CHANGE OF CHARGE. (MR. WRIGHT'S FIGURES.)

	Roasted.	Crude.
9½ lb. coke @ 6.71 cal.	63.75 cal.	
10 lb. sulphur @ 2.66 cal.	26.60 cal.	
15 lb. sulphur @ 3.55 cal.		53.25 cal.
Total	90.35 cal.	53.25 cal.
Loss by change from roasted to crude ore		37.10 cal.

From this he concludes that there is not sufficient heat developed to permit the smelting of the charge. If, however, we correct these figures, we find a balance as follows:

HEAT QUANTITIES INVOLVED BY CHANGE. (CORRECTED FIGURES.)

	Roasted.	Crude.
9½ lb. coke @ 6.71 cal.	63.75 cal.	
10 lb. sulphur @ —2.69	—26.90 cal.	
15 lb. sulphur @ 3.55		53.25 cal.
Total	36.85 cal.	53.25 cal.
Balance in favor of crude ore charge		26.40 cal.

We have thus a gain of 26.4 cal. by the change from roasted to crude ore. Following Mr. Wright's own reasoning we are compelled to assume that the charge has a sufficient heat provision, irrespective of his assumed reduction in silica. From this we are led to look for some mistaken assumption or error in the first part of his article which agreed with his apparently incorrect conclusion.

Before proceeding farther I wish to call attention to the fact that the unit of heat used is the pound-calorie and not the great calorie. This does not affect the figures given, but might lead to error if not borne in mind when making comparisons.

SILICA AND MATTE FALL

Referring to the JOURNAL's compilation on "Pyrite Smelting," we find considerable data given by Parke Channing relative to the smelting of pyrrhotite ore from which I have made out the charge sheet given below. As he does not give the relative amounts of the two ores used, I have taken the arithmetical mean of the assays to represent the mixture. This seems to consist of ores directly from the mines in approximately equal proportions, and he seems to change from one to the other. He states that they aimed to make a 12 per cent. matte and that the furnace seemed to produce a slag containing 40 per cent. SiO_2 irrespective of the amount of quartz added. He also gives a matte analysis.

ANALYSES OF SMELTING MATERIAL AND PRODUCTS.

	Ore, Per Cent.	Matte, Per Cent.	Slag, Per Cent.
Copper	2.6	11.9	0.2
Sulphur	25.5	25.6	0.7
Iron	34.25	54.0	
Lime	6.15		
Magnesia	2.2		
Alumina	4.15		
Silica	18.3		40.0
Zinc	1.4	1.7	

He gives as a charge (arithmetical mean): Ore, 4500 lb.; quartz, 700 lb.; coke, 135 lb. This he states was changed as necessary to produce a 12 per cent. matte and 40 per cent. SiO_2 slag. I have reduced it to a 100-lb. basis and varied it slightly for the purpose indicated, and calculated a charge sheet as follows:

CHARGE SHEET — PYRRHOTITE ORE, TENNESSEE.

	Ore.	Matte.	Slag.
Quartz, 11 lb.:			
Silica	10.78 lb.	0.15 lb.	10.63 lb.
Ore, 89 lb.:			
Silica	16.29		16.29
Iron	30.48	9.89	26.47
Sulphur	22.69	4.69	0.47
Lime	5.47		5.47
Magnesia	1.96		1.96
Alumina	3.69		3.69
Zinc	1.25	0.34	1.16
Copper	2.31	2.18	0.13
Difference	4.86	1.07	0.07
Coke, 2.6 lb.:			

For comparison I now give a charge sheet arranged on a similar basis; that is, in regard to percentage of silica in the slag and the number of units of sulphur oxidized. I have, however, varied them slightly, for we have Mr. Heywood's authority that the furnace ran well on an 8.1 per cent. matte and that the slag ranged from 39 to 40 per cent. I have accordingly assumed an oxidation of 16.75 lb. sulphur and a slag of 39 per cent. SiO_2. In opposition to Mr. Wright, I assume the use of quartz for flux. Mr. Beardsley states that quartz and coke were fed by hand.

CHARGE SHEET FOR NICKEL-BEARING PYRRHOTITE.

	Ore.	Matte.	Slag.
Quartz, 20 lb.:			
Silica	19.6 lb.	0.16 lb.	19.44 lb.
Ore, 80 lb.:			
Silica	8.08		8.08
Iron	35.76	8.44	35.13
Sulphur	22.00	4.75	0.50
Copper	1.42	1.28	0.14
Nickel	4.50	4.36	0.14
Lime	0.96		0.96
Magnesia	0.88		0.88
Alumina	5.48		5.48
Difference		0.80	0.07
Coke, 3.5 lb.:			
Sulphur in gas, 16.75 lb.:			

We are justified in this comparison because conditions as to furnace and blowing capacity are very similar at the two plants. Some discrepancies are to be noted, due to the incorrectness of the reported constitution of the ore. Thus Mr. Beardsley says that 9.1 per cent of the ore is FeO. If we add the oxygen in this to the analysis given we have a total of 100.82 per cent., not including any cobalt, zinc or manganese. I suspect the accuracy of the alumina determination, but this does not affect the figures seriously.

CAUSES OF DIFFERENCES IN REACTION

We have, then, two charges of similar composition, both as to elements and con-

stitution, which, however, under similar conditions, failed to react similarly. The first ran well in accordance with the figures given, the second failed entirely to give the expected products. The only points of difference appear to be in the lime, alumina, nickel, ferrous oxide, coke and oxidation. The lime in the Tennessee ore is replaced by ferrous oxide in the Canadian ore. There is a slight increase in the alumina content in the Canadian ore and a decreased oxidation compensated and accounted for by a small amount of additional coke. The main difference is, then, in the nickel.

Mr. Channing says that the furnace at Copperhill "selected" a 40 per cent. SiO_2 slag and decreased silica meant diminished oxidation irrespective of other condition. Since the conditions are similar it may be possible that Mr. Beardsley did not use sufficient silica. Information relative to this and the composition of the slag would be instructive and would be appreciated.

Returning to the question of heat Mr. Wright estimated in his hypothetical charge an oxidation of 11.0 lb. sulphur. Comparing this with the Copperhill charge we find a heat reduction of 17.53 $-$ 11.0 $=$ 6.53; and $6.53 \times 3.55 = 23.2$ cal.

Contrariwise we have a gain of 3.4 lb. coke at 6.71 cal. $=$ 22.8 cal., a total difference of only 0.4 calories. The heat absorbed by matte and slag is slightly (1.2 cal.) in favor of the hypothetical charge. So we have only the heat of the decomposition of the limestone to account for. Some value should be given to the heat of combination of the resulting CaO with the SiO_2 so this is partly negatived. There is not, then, sufficient difference in the heat factors to account for the troubles. Yet the furnace in the case under consideration was freezing up. I think, however, that the conditions given represent merely a phase, as if the air were blowing out the burning charge; so it seems to me that hot blast would have rendered material help if not entirely changing things.

The Question of Heat

Our comparisons show that similar charges with an apparently equivalent supply of heat have run satisfactorily, from which it would seem that sufficient heat had been provided. Mr. Wright's heat balance indicates that there was not. Let us then examine his figures more closely.

As to his credit items there is nothing to say unless it be that the value for the union of SiO_2 and FeO is probably negative, later determinations having shown the heat of formation of SiO_2 to be 7.595 cal. per unit of silicon. On the other hand, Landis gives the heat of formation of a 35.5 per cent. SiO_2 slag at 0.133 cal. per unit of slag.

Coming to his debit items, our attention is drawn to the heat carried away by escaping gases. I think his figures are too low here, but I have not worked the problem out carefully. The difference is probably due to the difference in composition between the gases used for his estimate and the gas resulting from this charge. Mr. Wright assumes 0.46 cal. per lb. of slag at 1250 deg. C. This value appears to be derived from Vogt's figure. Landis, however, for the slag mentioned gives:

Heat contents, liquid, at 1114 deg.	0.302 cal
Specific heat at 1114 deg. C.	0.269 cal
Total heat at 1250 deg.	0.338 cal

Landis gives for a matte of 47.3 per cent. Cu,

Heat contents, liquid, at 1000 deg.	0.204 cal.
Specific heat at 1000 deg.	0.138 cal.
Total at 1250 deg. C.	0.239 cal.

These two figures disagree violently with the older ones and I should like to see them confirmed.

The effect the presence of moisture, by displacement on the charge, has on the heat generated by the sulphur and heat lost in slag and matte has been omitted probably because of the neutral effect of the two quantities. Credit due to the union of the CaO with SiO_2 has been omitted probably because of its small value. It has been assumed that only about 60 per cent. of the oxygen in the blast was used. Water decomposes but slightly at temperatures under 1800 deg. C. by heat alone. It seems probable, therefore, that we should use only 60 per cent. of the figure given. Loss ascribed to radiation is certainly excessive. This figure makes it appear that the water-jackets radiated from their exterior about 45 per cent. of the heat received by them, which is improbable.

Changing the figures as indicated we have:

HEAT CONSUMED IN OPERATION.

Escaping gases	14.7 cal.
Slag 60.9×0.338	20.6
Matte 28.7×0.239	6.9
Cooling water	10.0
Evaporation	2.1
Decomposition of limestone	3.3
Decomposition of water	4.4
Total	62.0 cal.
Credit from combustion of coke and sulphur	83.0 cal.

This gives a credit balance to cover radiation and unnamed losses of 21.0 cal. which seems sufficient.

I give these figures as an example of the danger of drawing conclusions from these so-called heat balances until the data at our disposal are more accurate. I believe the true figure lies between the results here derived and those given in earlier articles.

Before going farther with this I should like to hear from Mr. Beardsley more definitely as to what he really did do.

Clarence Grabill.

El Paso, Texas, Nov. 13, 1907.

Several prospecting wells are being put down for petroleum in New Zealand, and it is said that there are very favorable indications that this island will soon become a producer of fair importance.

The Monongah Disaster

A despatch relating to the terrible Monongah disaster, which appeared in one of the newspapers, credited the president of the operating company with saying "that everything had been done to make the mines as safe as possible, and that in the interest of safety, the mines (No. 6 and No. 8) had been connected underground." It would appear from this that the company believed that it was acting wisely in making such underground connection, but in my opinion this idea is fallacious.

That every mine should have at least two entrances is patent, and is recognized by the mining laws of practically all States, but unfortunately the connection between two mines is considered a sufficient substitute. When the coal mines of this country were comparatively small, in the formation period of the mining laws, the requirement of two separate entrances in the case of small old mines with but one existing shaft would have been burdensome. It was, therefore, temporarily expedient to allow such connection between mines. But it appears in this case, and numerous others that I know of, a connection was made between new and modern mines that had two entrances independent of the connection with the neighboring mine.

The panel system, dividing a coal mine's workings into blocks each surrounded by a pillar of coal, except for two entrances, is well recognized among the more advanced mining communities as being the only safe plan, and in flat seams as the most economical method in the long run. It surely appears that if isolation and division of workings is a good thing it would be equally good for the isolation of the mine itself.

All mining men who have had occasion to trace the effects of an explosion will concede that the originating point of a mine explosion, whether from firedamp or blown-out shot, rarely manifests the effects of extreme violence; on the contrary the explosion gathers as it goes onward to a culminating point beyond, and if conditions are favorable this culmination is not reached till the limit of the mine. Hence, if mines are connected, as in the case of the two Monongah mines, and of the several Courrières mines in France, the disaster in one affects most seriously the connecting mine. It may be held that in some cases the connection might afford the chance of escape. In my opinion this chance would rarely come; such connections are usually in remote corners and through more or less abandoned workings. In the case of great disasters, such as cited, the connection would be no help; in the case of a lesser one, the concussion would destroy the ventilating doors between, making it difficult to re-establish currents, and in such a case the after-damp would in most

cases make the connection impossible to traverse. It may be argued that the ventilating fan of one mine would be of advantage in case of the other being damaged by the explosion, but if a fan is set out of line of a possible explosion, and there are properly arranged explosion-doors to give relief, there is little trouble on this score.

Had the Monongah mines not been connected probably half the victims would now be alive, and in the four or five Courrières shafts perhaps three-fourths of the 1200 victims would have been saved and not even endangered.

In my opinion an underground connection with another working mine doubles the hazard, not only of explosion but of mine fires. *Put in as many escapements as practicable in the individual mine, but don't connect the workings that do not have to be connected for getting out the coal.*

Since writing the above, the JOURNAL, of Dec. 14, has come to hand and I note that Mr. Parsons has made the same comment as to the connection of the mines; nevertheless, I will allow my letter to go forward, as I feel that it is necessary that there should be agitation about this subject. The danger of connecting mines does not appear to be appreciated generally. In the JOURNAL, of Dec. 7, your correspondent in Indiana makes special remark of the "successful engineering" which has connected five mines together in the Linton field.

Some years ago the Colorado Fuel and Iron Company spent much money to connect its Engleville and Starkville mines; later, on realizing its mistake it blocked the connection as well as it could; nevertheless, fire which raged in the Engleville mine seriously threatened for a time the Starkville mine; fortunately the barriers resisted, although the Engleville mine was shut down for a couple of years.

GEORGE S. RICE.

Chicago, Ill., Dec. 17, 1907.

The Wage Scale in Hopkins County, Kentucky

There seems to be a difference of opinion between John B. Atkinson, president of the St. Bernard Mining Company, and T. L. Lewis, vice-president of the United Mine Workers of America. Mr. Atkinson, in the JOURNAL of Dec. 14, criticized a statement in the previous issue of the JOURNAL, and said that the United Mine Workers had nothing to do with the wage scale in Hopkins, Webster and Christian counties, Kentucky, where, according to Mr. Atkinson, there are no union miners. Mr. Lewis, on the other hand, states that there are union miners there and that a wage scale is being arranged. Of course time will settle the dispute.

A. B. C.

Indianapolis, Ind., Dec. 17, 1907.

Value of Molybdenite

What is the value of high-grade molybdenite ore and how much of a market for it is there?

P. B. B.

Melrose Highlands, Mass., Nov. 21, 1907.

Molybdenite is usually sold under a guarantee to contain a minimum of 92 per cent. of molybdenum sulphide (MoS_2). Mineral of this quality is worth about 30c. per lb. in the present market.

The demand for molybdenite and wulfenite is small. We doubt if the entire American consumption exceeds 20 or 25 tons per annum.

Determination of Antimony and Tin in Babbitt or Other Alloys

W. H. Low (*Journ.* Am. Chem. Soc., XXIX, pp. 66-74) has described a method for the direct determination of antimony and tin in one portion of the alloy without separating the other ingredients, and the titration of antimony and tin when both are present in solution. The two standard solutions used are an N/10 potassium permanganate, and an N/10 iodine solution.

The standardization is performed by weighing 0.1202 gram of finely powdered c.p. antimony, or 0.3234 gram of tartar emetic, and 0.1190 gram of tin, into a 450-c.c Jena glass Erlenmeyer flask with 10 c.c. of strong chlorine-free sulphuric acid and 3 to 4 grams of potassium sulphate. The flask is heated until solution is complete and all sulphur or sulphurous acid has been expelled, leaving at least 7 c.c. sulphuric acid in the flask. The flask is cooled, 50 c.c. of water and 10 c.c. of strong hydrochloric acid added and the solution heated until the antimony and tin are in solution. In analyzing an alloy containing a larger amount of antimony, tartaric acid is added at this point to aid in the solution. The solution is cooled, 110 c.c. of water and 25 to 30 c.c. of strong hydrochloric acid added, and the perfectly cold solution titrated with permanganate. The permangante is added until the last drop colors the whole solution pink. This color will fade, but this is not to be taken into account, the first pink color being the end point. The solution, now ready for the estimation of the tin, is transferred to a 500-c.c. round-bottomed flask, rinsing out the Erlenmeyer with 50 c.c. of strong hydrochloric acid. The solution containing at least one-fifth by volume of hydrochloric acid, is warmed on a steam bath for 15 min. with one gram of finely powdered c.p. antimony, shaking once in a while. The flask is removed from the bath, corked up and connected with a carbon dioxide generator. The delivery tube from the generator passes through the cork and dips below the solution while the outlet tube from the flask is bent downward and dips into water or mercury. A rapid stream of gas is passed through the flask, at the same time heating its contents to boiling by means of the naked flame of a lamp applied to the sides of the flask. The boiling is continued for 2 to 3 min., the flask quickly cooled with cold water while still passing a strong current of carbon dioxide through it. The cork is cautiously loosened, 5 c.c. of good starch solution introduced, the flask disengaged from the gas apparatus, corked and taken to the burette. The spit of the burette is inserted well down in the neck of the flask and the solution titrated with the N/10 iodine solution, titrating to a strong blue color and correcting for the indicator error.

METHOD APPLIED TO ALLOYS

In analyzing an alloy the same procedure is followed as in the standardization. In some alloys the decomposition is best effected with nitric acid, the nitric acid expelled with sulphuric acid and potassium sulphate, then tartaric acid added and boiling continued until all organic matter has been destroyed. Arsenic interferes with the method and if present must be removed. The method is also applicable to the estimation of antimony and tin where they have been separated from other metals by means of alkaline sulphides. The method followed when the alloy has been decomposed with aqua regia and the antimony and tin are in solution in alkaline sulphides, is to add a slight excess of sulphuric acid and warm gently to precipitate the antimony and tin sulphides. The precipitated sulphides are filtered and washed with dilute hydrogen sulphide water containing ammonium acetate, until free from chlorine. The filter paper and sulphides are placed in a 450-c.c. Jena glass Erlenmeyer flask, 10 to 20 c.c. strong sulphuric acid and 3 to 4 grams potassium sulphate added and the whole boiled until all organic matter has been destroyed and not over 10 c.c. of acid is left. To save the time taken to destroy the filter paper, an alternative is to wash the sulphides from the filter into the flask, dissolve what remains on the filter with chlorine-free alkaline sulphide, add this to the flask with enough more alkaline sulphide to dissolve the antimony and tin sulphides on warming, and then acidify with sulphuric acid, add 10 to 15 c.c. in excess with 3 to 4 grams of potassium sulphate and proceed as before.

The utilization of scrap and waste mica in the manufacture of lubricants for car axles has become a somewhat important industry in the West.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALUMINUM PRODUCTION—Art of producing aluminum and other metals. Henry S. Blackmore, Mount Vernon, N. Y. (U. S. No. 872,985; Dec. 3, 1907.)

CEMENT

MAGNESIUM CEMENT and process of making the same. Emil Rueff, New York, N. Y. (U. S. No. 872,375; Dec. 3, 1907.)

CLAY

METHOD OF PURIFYING. A. E. Gaved, St. Austell. A dry process for separating china clay from mica and quartz in decomposed granite. (Brit. No. 27,034 of 1906; Nov. 30, 1907.)

COAL AND COKE

COAL-CUTTING MACHINE. Austin Hopkinson, Manchester, England. (U. S. No. 871,592; Nov. 19, 1907.)

COAL-CUTTING MACHINE. Hubert L. Smith, Edri, Penn. (U. S. No. 872,675; Dec. 3, 1907.)

COAL DRILLS—Frame for supporting coal drills. William H. Clarkson, Edwards Station, Ill. (U. S. No. 873,019; Dec. 10, 1907.)

COAL-WASHER. Daniel H. Gray and George S. Gray, Dunbar, Penn. (U. S. No. 871,499; Nov. 19, 1907.)

COKE-OVEN DOOR. Heinrich Koppers, Essen-on-the-Ruhr, Germany. (U. S. No. 871,421; Nov. 19, 1907.)

COKE-OVENS. Door-jamb for coke-ovens. Enoch H. Abraham, Uniontown, Penn., assignor to Covington Door Jamb Co., a Corporation of Maine. (U. S. No. 873,479; Dec. 10, 1907.)

DRILLS. C. Kearton, Flint. Improved feed nut for regulating the feed of rotating coal drills. (Brit. No. 4853 of 1907; Nov. 23, 1907.)

DUST IN COLLIERIES.—Bell Brothers and R. Harle, Middlesbrough, England. Allaying dust given off by colliery wagons while being hauled along the levels, by means of sprays driven by pumps which are operated by the hauling rope. (Brit. No. 3612 of 1907; Nov. 23, 1907.)

COPPER

ELECTRODEPOSITION OF COPPER. S. O. Cowper Coles, London. In the electrodeposition of copper from crude copper or ores the interposition of an intermediate electrode between the anode and cathode. (Brit. No. 24,986 of 1906; Nov. 30, 1907.)

PURE COPPER. L. Jumau, Paris, France. Producing pure copper by precipitating the metal from sulphate of copper by the action of sulphurous acid under heat in a closed vessel. (Brit. No. 530 of 1907; Nov. 16, 1907.)

GOLD AND SILVER

CHLORIDIZING PROCESS—Process of chloridizing ores. John E. Greenawalt, Denver, Colo. (U. S. No. 873,309; Dec. 10, 1907.)

EXTRACTION FROM SULPHIDE ORES—Process for extracting gold and silver from ores. Gilbert Gurney, Berkeley, Cal. (U. S. No. 871,766; Nov. 19, 1907.)

TUBE MILL LINING. J. R. Brown, Los Angeles, Cal. Forming ribs with lining plates of tube mills in which the pebbles will lodge. (Brit. No. 17,983 of 1907; Nov. 16, 1907.)

GRAPHITE

AMORPHOUS CARBON—Process for the production of amorphous carbon. Josef Machtolf, Böblingen, Germany. (U. S. No. 872,949; Dec. 3, 1907.)

IRON AND STEEL

MANGANESE STEEL—Manufacture of high-per-cent.-manganese steel. Charles H. Kelsall, Horwich, England. (U. S. No. 873,556; Dec. 10, 1907.)

OPEN-HEARTH STEEL PLANT. Frank H. Crockard, Birmingham, Ala., assignor of one-half to Alexander Laughlin, Sewickley, Penn. (U. S. No. 872,800; Dec. 3, 1907.)

STEEL INGOTS—Apparatus for compressing steel ingots. Nils H. O. Lilienberg, Philadelphia, Penn. (U. S. No. 872,830; Dec. 3, 1907.)

ZINC

ZINC OXIDE. W. and H. Simm, Prescot, Lancashire. Improved furnace for refining zinc oxide. (Brit. No. 21,787 of 1906; Nov. 2, 1907.)

ZINC SKIMMINGS—Process of utilizing zinc skimmings. Bruno Terne, Philadelphia, Penn. (U. S. No. 869,750; Oct. 29, 1907.)

MINING—GENERAL

ORE RAISING. J. Brindley, Wolverhampton. A pneumatic system for raising ore or coal through pipes to the surface. (Brit. No. 25,769 of 1906; Nov. 16, 1907.)

CONCENTRATING TABLES. A. Schwartz, New York, N. Y. Providing concentrating tables with fine grooves which will serve to catch the values, but will not catch the larger particles of gangue. (Brit. No. 29,728 of 1906; Nov. 16, 1907.)

CONCENTRATION—Method of concentrating ores. Alfred Schwartz, New York, N. Y. (U. S. No. 871,368; Nov. 19, 1907.)

CONCENTRATOR. Calvin H. Wilkie, Douglas, Ariz. (U. S. No. 871,546; Nov. 19, 1907.)

FILTER for separating solutions from orepulp. Charles L. Buckingham, Denver, Colo., assignor of one-half to Robert B. McConney, Denver, Colo. (U. S. No. 871,860; Nov. 26, 1907.)

FILTER-PRESS. Frank B. Anderson, Cleveland, Ohio. (U. S. No. 873,482; Dec. 10, 1907.)

FILTER-PRESS. Frederick W. von Oven, Aurora, Ill. (U. S. No. 872,008; Nov. 26, 1907.)

MAGNETIC SEPARATOR. Alfred Schwartz, New York, N. Y. (U. S. Nos. 871,298, 871,301, 871,365, and 871,367; Nov. 19, 1907.)

ORE-CONCENTRATING TABLE. Alfred Schwarz, New York, N. Y. (U. S. No. 871,369; Nov. 19, 1907.)

ORE-CONCENTRATOR. John R. Capps, Middletown, Cal. (U. S. No. 872,555; Dec. 3, 1907.)

ORE-CONCENTRATOR. Joseph Algert, Denver, Colo. (U. S. No. 868,830; Oct. 22, 1907.)

ORE-CRUSHER. H. W. Hardinge, New York, N. Y. A drum with conical ends revolving horizontally, for use in crushing friable ores. (Brit. No. 12,719 of 1907; Nov. 30, 1907.)

PULVERIZERS. A. E. Flewin, Liskeard, and C. M. Bestic, London, England. Improvements in pulverizers in which rapidly rotating arms reduce the ore to powder, the object being to provide easily renewable working parts. (Brit. No. 13,257 of 1907; Nov. 23, 1907.)

SEPARATING PROCESS and apparatus. William E. Pearse, New York, N. Y. (U. S. No. 873,326; Dec. 10, 1907.)

SEPARATION—Apparatus for separating the metallic particles of ores from the rocky constituents thereof. Dudley H. Norris, New New York, N. Y. (U. S. No. 873,586; Dec. 10, 1907.)

STAMP-MILL. Francis I. Matthews, Oakland, Cal., assignor to Oakland Stamp Mill Co., Oakland, Cal., a Corporation. (U. S. No. 873,323; Dec. 10, 1907.)

TAILINGS-DISCHARGE VALVE. Alfred Schwarz, New York, N. Y., assignor to Schwarz Engineering Co., New York, N. Y., a Corporation of New York. (U. S. No. 871,299; Nov. 19, 1907.)

TAILINGS-SETTLER. Alfred Schwarz, New York, N. Y., assignor to Schwarz Engineering Co., New York, N. Y., a Corporation of New York. (U. S. No. 871,366; Nov. 19, 1907.)

METALLURGY—GENERAL

ELECTRIC FUSION. General Electric Company, Schenectady, N. Y. A method of melting or sintering refractory material by making it an anode in a vacuum electric furnace having as cathode a vaporizable material such as mercury. (Brit. No. 21,667 of 1906; Oct. 19, 1907.)

ELECTROLYTIC REFINING. S. O. Cowper Coles, London, England. In the electrolytic refining of metals, the arrangement of three electrodes concentrically, the inner and outer being the cathode and the middle one the anode, and the whole rotated at a high speed. (Brit. No. 24,985 of 1906; Nov. 9, 1907.)

FURNACE CHARGING. E. Viel, Rennes, France. Improved method of introducing the charge, when reducing aluminum, magnesium, silicon, etc., in high temperature furnaces. (Brit. No. 24,352 of 1906; Nov. 30, 1907.)

LEACHING PROCESS—Process of leaching ores. Alfred Schwarz, New York, N. Y., assignor to Schwarz Engineering Co., New York, N. Y., a Corporation of New York. (U. S. No. 871, 300; Nov. 19, 1907.)

MINING MACHINERY AND APPARATUS

MINE-DOOR. Oscar N. Earthom and Tolbert Gallaher, Adena, Ohio, assignors of one-third to George W. Tidrich, Dillonvale, Ohio. (U. S. No. 870,420; Nov. 5, 1907.)

ROCK DRILLING MACHINES. S. and A. Maynard and F. Gale, Johannesburg, South Africa. Improved chucks for holding the drills in rock drilling machines. (Brit. No. 24,832 of 1906; Nov. 16, 1907.)

FURNACES

ELECTRIC FURNACE and method. Paul L. T. Héroult, La Praz, France, assignor to Société Electro-Metallurgique Francaise, Froges, Isère, France. (U. S. No. 871,273; Nov. 19, 1907.)

ELECTRIC FURNACE. Frank J. Tone, Niagara Falls, N. Y. (U. S. No. 870,326; Nov. 5, 1907.)

ELECTRIC FURNACE. M. Ruthenburg, New York, N. Y. An electric furnace for melting fine ores through which sprays of reducing gases are forced in order to produce metal. (Brit. No. 21,876 of 1906; Nov. 2, 1907.)

ELECTRIC FURNACE. Paul L. T. Héroult, La Praz, France, assignor to Société Electro-Metallurgique Francaise, Froges, France. (U. S. No. 871,338; Nov. 19, 1907.)

REVERBERATORY FURNACE FEEDING—Method of feeding reverberatory furnaces. Henry L. Charles, Salt Lake City, Utah, assignor of one-half to Fritz Augustus Heinze, Butte, Mont. (U. S. No. 871,477; Nov. 19, 1907.)

SINTERING FURNACES. J. G. Bergquist, Chicago, Ill. Improvements in furnaces used in sintering, especially with the object of preserving the moving parts from the effects of heat. (Brit. No. 23,869 of 1906; Nov. 23, 1907.)

SMELTER SMOKE—Apparatus for obtaining sulphur from furnace-gases. Franklin R. Carpenter, Denver, Colo., assignor of one-fourth to Arthur Howe Carpenter, one-eighth to Cranston Howe Carpenter, and one-eighth to Malcolm Howe Carpenter, Denver, Colo. (U. S. No. 871,912; Nov. 26, 1907.)

INDUSTRIAL CHEMISTRY

SULPHUR DIOXIDE—Process of making sulphur dioxide. John G. Jones, Carthage, N. Y. (U. S. No. 872,822; Dec. 3, 1907.)

SULPHURIC ACID. L. G. Foomont, Brussels, Belgium. In the lead chambers used in the manufacture of sulphuric acid, means for abstracting the heat so as to keep the temperature of the reaction constant. (Brit. No. 4861 of 1907; Nov. 16, 1907.)

Troops to Leave Goldfield

The President sent the following telegrams to Governor Sparks of Nevada under dates of Dec. 17 and 20 respectively:

(1.) "I sent the troops at your request because from the tenor of your telegrams and from the representations made me by the two Senators from Nevada and the member of the lower House of Congress from Nevada it appeared that an insurrection was imminent against which the State authorities would be powerless.

The troops have now been in Goldfield ten days and no insurrection has occurred, and seemingly no circumstances exist to justify your now calling on me for action by the troops under the provision of the Constitution.

The troops were sent to Goldfield to be ready to meet a grave emergency which seemed likely at once to arise, and not to provide a substitute for the exercise by the State of its police functions.

I do not feel at liberty to leave them indefinitely under such circumstances that they will in effect be performing on the part of the United States those ordinary duties of maintaining public order in the State of Nevada which rest upon the State Government.

As the Legislature of Nevada has not been convened I am bound to assume that the powers already vested in the peace officers of the State are adequate and that if they choose to do so they can maintain order themselves. Under these circumstances, unless there be forthwith further cause shown to justify keeping the troops at Goldfield I shall direct that they return to their former stations."

(2.) "I have received no answer from you to my telegram of December 17, in which I said that unless there was forthwith further cause shown to justify keeping the troops at Goldfield I should direct their return to their former stations.

I am informed by the three representatives of the Department of Commerce and Labor who are in Goldfield by my order that you have stated to them in writing that you will not convene the Legislature to consider call for troops nor take the necessary steps to form a State military force.

Their report further satisfies me that there is no disturbance threatened which the Government of Nevada ought not to be able to control if it starts to work with a serious purpose to do so, but that no effort is being made by the Government of Nevada to take the steps necessary in the matter.

I stand ready to see that the national Government does its full constitutional duty in the matter of preserving order, but this readiness on the part of the national Government does not excuse the State Government for failure to perform its full duty in the first place.

Federal aid should not be sought for by the State as method of relieving itself from the performance of this duty, and the State should not be permitted to substitute the Government of the United Sates for the Government of the State in the ordinary duties of maintaining order within the State.

For the reasons given in this and my former telegram I have accordingly directed the troops to return to their former station, Monday, December 30, next."

On Dec. 21 the Secretary of War issued the formal order to withdraw the troops Dec. 30 Governor Sparks made the statement, Dec. 21, that advices from confidential agents convinced him of serious trouble at Goldfield, and that unless troops were sent there, bloodshed and destruction of property were certain. The sheriff of Esmeralda county is unable to prevent violence or convict persons guilty of crime against mine owners. Governor Sparks declares that the withdrawal of the troops will be a serious mistake, although he will do his best to maintain order. The Governor says the President's commission reported before it had time to learn all the facts.

William Thomson, Lord Kelvin

Lord Kelvin, who had been for years regarded as one of the greatest living scientists, and the foremost authority on electricity, died at his home near Glasgow, Scotland, Dec. 17, after an illness of several weeks. Although he was 83 years old, he was an active man up to his last illness, and had never given up the work of study and investigation; while his advice was constantly sought by others.

William Thomson was born in Belfast, Ireland, June 26, 1824, being the son of James Thomson, professor of mathematics in Glasgow University. He was educated at Glasgow and Cambridge, taking high honors at both universities. His ability was early recognized, and in 1846, when he was only 22 years old, he was made professor of natural philosophy at the University of Glasgow; a position which he held for 53 years. He was one of the first to engage in the study of electricity, and this led to his connection with some important enterprises. He was electrician for the Atlantic cable when the first attempt was made to lay it in 1857-58 and again in 1865-66. He also acted as electrician for the French line in 1869, for the Brazilian & River Plate in 1873, the West Indian in 1875 and the Commercial in 1879. After his early work on the cables he became acknowledged as England's greatest electrician, and for a long time every important electrical proposition that came up was referred to him for an opinion. He was the designer of one of the earliest practical alternating-current dynamos and when there was first talk of utilizing the water power of Niagara for the development of electrical energy Sir William Thomson was made chairman of the advisory board that took the matter under consideration.

The laying of the ocean cable was not his only work in connection with this form of enterprise. He devoted much time to the invention of devices for improving marine telegraphy and first showed how it was possible to overcome sluggishness in transmission. He invented an important device for recording cable messages, called "the siphon recorder," and one of his inventions was a telegraph key for use in connection with this sort of work. Many instruments for measuring the strength of electrical currents were also his inventions. Other inventions included a method of mounting the mariner's compass so as to improve the effectiveness of this instrument greatly.

It was not only the more practical side of his work that attracted him; he devoted much time to investigations in physical science and the higher chemistry. Some of his work, though most important, was of a character that did not bring him into prominence. Such work included, for example, speculative matters relating to the age of the earth and the nature of atoms. Another line which his investigations followed related to the precise amount of mechanical power which was the equivalent of a given quantity of heat.

Unlike some men of great scientific knowledge, Lord Kelvin was a man of the world, with a strong perception of practical values. He accumulated a considerable fortune from fees for his services and from patents he had taken out. He had a strong sense of the value of the knowledge he had acquired, though he was always reserved and modest in his claims. He was willing to share his knowledge with the world, and wrote a large number of papers for scientific societies and periodicals besides several books. He was too busy a man, however, to devote much time to literary work.

Beginning his work early in life he received many honors before its close. He was several years president of the Royal Society of Great Britain, and was a member of nearly all the prominent scientific societies in Europe and the United States. He served one term as rector of Glasgow University. He was made Sir William Thomson in 1867, and Lord Kelvin in 1892, in recognition of his services. He received decorations from several foreign governments. He was twice married but leaves no heir to his title. He made several visits to this country, the last one being in 1902. At that time he was everywhere greeted with great enthusiasm and received the degree of LL.D. from Yale University.

Lord Kelvin was a scientist of a high type, and while he was devoted to investigation and the study of what is often called pure science, he never lost sight of its possible application to the service and improvement of humanity.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments

Harry L. Derby is at Zaragoza, Colombia.

Lester W. Strauss is examining mines in Peru.

William Bruce is on his way to Quibdo, Colombia.

Franklin W. Smith is examining mines near Zacatecas, Mexico.

Raymond L. Linton is examining placer and vein mines in Ecuador.

J. P. Keene is investigating dredging ground near Grangeville, Idaho.

Rene E. Hazard is operating a hydraulic mine near Amalfi, in Colombia.

W. B. Gladding has just returned from an inspection of mines near Baker City, Oregon.

W. E. Defty is at present engaged in making examinations in the district of Tombstone, Arizona.

E. J. Carlyle sailed from New York, Dec. 19, on his way to Kushtim in the government of Perm, Russia.

Philip R. Bradley, manager of the Peters mine, British Guiana, has arrived in New York from California.

J. G. Hopkins, of Greenwich, Conn., is to be elected president of the Arizona Copper Company, to succeed James Colquhoun.

John Power Hutchins has returned to New York from Baker City, Oregon, where he was engaged in drilling dredging ground.

Raymond Lewis has been aupointed superintendent of blast furnaces of the Algoma Steel Company, at Sault Ste. Marie, Ontario.

William Wallace, superintendent of the District Copper Mining Company's smelter, is in Denver, Colo. convalescing from typhoid fever.

Leon Dominian, superintendent of the Minas Bonanza y Anexas, at Bonanza, Zacatecas, Mexico, will be in New York for a few weeks.

E. Deister, who has been experimenting with his slime table at Morenci, Arizona for three months, has gone to Fort Wayne Ind., for a short time.

A. F. Schneider, general manager of the Nevada Utah Mines and Smelters corporation, has resigned and has been succeeded by L. R. Loomis, vice-president of the company.

I. T. Fiero has sold his interest in and severed his connection with the Metallurgical Laboratory, Pittsburg. He will establish an office in Pittsburg as consulting and inspecting engineer.

John A. Rice has severed his connection with the Chemung Copper Company at Tyrone, N. M., and will resume his practice as consulting mining engineer, with offices at El Paso, Texas.

S. Howard Brady has been appointed superintendent of the Tonopah-Belmont mines at Tonopah, Nev. He was formerly assistant superintendent of the Michigan copper mine in the Lake Superior district.

Axel Andenberg, mining engineer, formerly with the Delaware, Lackawanna & Western, at Lebanon, Penn., is now with the Dominion Iron and Steel Company, in charge of development work at the recently acquired coal properties at Lepreaux, New Brunswick.

The organization of the Department of Mines of the Dominion of Canada is as follows: Hon. W. Templeman, minister of mines; Dr. Albert P. Low, deputy minister of mines; R. W. Brock, acting director of the Geological Survey; Dr. Eugene Haanel, director of the Mines Branch.

The section of chemistry and mineralogy heretofore attached to the Geological Survey of Canada, has been transferred to the Mines Branch of the Ministry of Mines. Robert A. A. Johnston, formerly head of the section, will remain with the Geological Survey, doing geological work.

Obituary

William Barnes, a coal-mine operator of Lethbridge, Alberta, Canada, died suddenly at Montreal, Dec. 10, at the age of 65 years. He was on his way to England.

Felipe Muriedas, one of the most prominent members of the Spanish colony in San Luis Potosi, Mexico, head of large industrial enterprises in the republic and largely interested in mining, died on Dec. 16, at the home of his only daughter, Mrs. Manuela Muriedas de Zavale. All the leading business houses of San Luis Potosi were closed on the day of the burial, Dec. 17.

Col. Arthur D. Colyar died at Nashville, Tenn., Dec. 13, aged 90 years. He was a pioneer of the Southern iron industry. In 1858 he organized the Sewanee Mining Company, of which he was president. After the war this company was consolidated with two others to form the Tennessee Coal, Iron and Railroad Company, and Colonel Colyar was president of the new company for several years. He was interested in other coal and iron enterprises, but retired from active business several years ago.

George McCulloch, who died in London, Dec. 12, aged 59 years, was for many years prominent in Australian mining. He was born in Scotland and graduated from Glasgow University, going while a young man to South America and some years later to Australia. He was actively identified with the Broken Hill mines, from the first discovery, and held office in several Australian mining companies. He was president of the Barrier Ranges Mining Companies' Association during the strike of 1892. Mr. McCulloch retired from active business several years ago.

George Jackson Humbert, who died in Pittsburg, Dec. 11, aged 58 years, was born in that city. In 1880 he was connected with the Colorado Steel and Iron Company, but returned to the East some years later. He was in charge of the Glasgow Iron Works at Pottstown, Penn., for a time. About 1890 he took charge of the Connellsville Extension Company, which he organized. When that plant was absorbed by the American Tin Plate Company, Mr. Humbert became manager of the Eastern department of the consolidation, and retained that position until his death.

James K. Eveleth died of heart disease at Garfield, Utah, early in December. He was 47 years of age, and was born in Longmeadow, Mass., where his family still lives. He went to Montana in 1883, and was employed at the old Bell smelter as chemist and assayer. He then went to Colorado, but returned to Butte in 1886, and was employed at the Colorado smelter as chemist and assayer, going from there to the chemical laboratory of the Anaconda smelter, where he was employed two years. He next went into the ore business in Butte. In 1893 he went to Europe for several months, then went to Korea to examine mines for California parties. For several years he conducted an assay office in San Francisco. He then went to New Mexico in the employ of the Hearst estate, then to El Paso to superintend the sale of ores at the smelter for the Hearst estate, thence to Chihuahua, Mexico, where he was in charge of mining operations for the same people In 1906 he went to Cuba examining mines. He went to Utah in April of this year. Mr. Eveleth was a thoroughly competent assayer, and his judgment on mines was considered valuable. He had many warm friends in the mining fraternity.

Societies and Technical Schools

Wisconsin State Mining School—It is announced that this school at Platteville will open Jan. 27, with three regular instructors. In addition to this, arrangements have been made for courses of lectures by several mining experts. For the first year there will be two terms of 20 weeks each.

American Society of Mechanical Engineers.—The next monthly meeting of the society will be held Jan. 14, in the Engineering Societies Building, at 29 West 39th street, New York. The subject will be "Car Lighting," the presentation being made by R. M. Dixon, president of the Safety Car Heating and Lighting Company.

Industrial

W. B. Hammond is now sales agent in New York for the Hammond Iron Works, of Warren, Penn., succeeding Herman Nieter. His office is at 29 Broadway.

The Thomas W. Pangborn Company, New York, has been reorganized as a stock company dealing in equipment and supplies. The officers are ; Thomas W. Pangborn, president and treasurer; Edward R. Cooledge, vice-president; John C. Pangborn, Secretary.

The J. R. Alsing Company, New York, gives notice that it has changed its name to the J. R. Alsing Engineering Company. At the same time it increased the capital stock from $20,000 to $100,000, which was done on account of the increase in business. The officers of the new company will be the same as those of the old company.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

National Tube Company, Pittsburg, Pa. Modern Welded Pipe. Pp. 31, illustrated, paper, 6x9 in.; 1907.

Sturtevant Mill Company, Boston, Mass. Series 105. Newaygo Separator. Pp. 8, illustrated, paper, 7x9 in.

The Cyclone Drill Company, Orrville, Ohio. Prospecting and Milling Machinery. Pp. 96, illustrated, paper, 6x9 in.

Taylor Brothers Company, Rochester, N. Y. Verschoyle Patent Transit. Pp. 19, illustrated, paper, 5x6 in.; 1907.

Sparta Iron Works Company, Sparta, Wis. Well-drilling Machinery and Tools. Pp. 64, illustrated, paper, 7½x10½ in.

Bruner Steel Wagon Company, Wapakoneta, Ohio. The Bruner Steel Wagons. Pp. 10, illustrated, paper, 3½x6¼ inches.

Vulcan Iron Works, Wilkes-Barre, Penn. Elevating and Conveying Machinery. Pp. 54 illustrated, paper, 6x9 in.

Indianapolis Switch and Frog Company, Springfield, Ohio. High-grade Track Material. Pp. 84, illustrated, cloth, 9x12¼ in.

D. T. Williams Valve Company, Cincinnati, Ohio. Williams Regrinding Valves. Pp. 16, illustrated, paper, 3½x6 in.

Burkart & Williams, Denver, Colo. The B. & W. Safety Mine Cage Dogs and Landing Chairs. Pp. 12, illustrated, paper, 6x9 inches.

Traylor Engineering Company, 2 Rector street, New York. Traylor Concentrating Table. Pp. 23 illustrated, paper, 7x10 inches.

Vilter Manufacturing Company, Milwaukee, Wis. Catalog E. Corliss Engines. Pp. 67, illustrated, paper, 7x10 in.; September, 1907.

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Cook's Standard Tool Company, Kalamazoo, Mich. Labor-Saving Track Appliances. Pp. 16, illustrated, paper, 6x9 in.; Oct. 15, 1907.

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Sandusky Foundry and Machine Company, Sandusky, Ohio. Power Pumps and Paper Mill Machinery. Pp. 32, illustrated, paper, 6x9 in.

The J. Geo. Leyner Engineering Works Company, Littleton, Colo. Leyner Drill Sharpener Size Number One. Pp. 8, illustrated, paper, 3x6 in.

Craig Ridgway & Son Company, Coatesville, Penn. Steam Hydraulic Elevator; Cranes and Other Devices. Pp. 64, illustrated, paper, 6x9 in.

The Western Metallurgical Company, 618 Eighteenth street, Denver, Colo. Mineralogists' Pocket Reference. Pp. 47, illustrated, paper, 3x6 inches.

Fried. Krupp Aktiengesellschaft Grusonwerk, Magdeburg-Buckau, Germany. Steel Rolls and Metal Presses. Folder, illustrated, paper, 9x11¼ inches.

The Barrett Electric Manufacturing Company, Cincinnati, Ohio. Bulletin 106. Polyphase Induction Motors. Pp. 8, illustrated, paper, 8x10 in.; October, 1907.

Kilgore-Peteler Company, Minneapolis, Minn. Catalog No. 5. Peteler Industrial and Mine Cars. Narrow-gage Railways. Pp. 56, indexed, illustrated, paper, 6x9 in.

Cling-Surface Company, 1032-1048 Niagara street, Buffalo, N. Y. The Treatment of Belts and Ropes for Service and Profit. Pp. 87, indexed, illustrated, cloth, 4½x7 in.

Golden-Anderson Valve Specialty Company, Fulton Building, Pittsburg, Penn. Catalog No. 10. Valves. Pp. 56, illustrated, paper, 5½x8 in.; November, 1907.

Macomber & Whyte Rope Company, 266-268 S. Clinton Street, Chicago, Ill. Catalog E. Wire Rope. Pp. 72, indexed, illustrated, paper, 3½x5½ in.; 1908-1909.

Wickes Brothers, Saginaw, Mich. Monthly Stock List of Boilers, Engines, Dynamos, Motors and Machinery. Pp. 32, indexed, paper, 3¼x6 in.; November 15, 1907.

American Gröndal-Kjellin Company, 45 Wall street, New York. Bulletin No. 1. Concentration and Briquetting of Iron Ores. Pp. 15, illustrated, paper, 7½x10 in.; 1907.

Westinghouse Machine Company, East Pittsburg, Penn. Catalog P. Westinghouse Storage Batteries for Portable Use. Pp. 31, illustrated, paper, 6x9¼ in.; November, 1907.

The Kelly Filter Press Company, Salt Lake City, Utah. Recent Improvements in the Art of Slimes Treatment by D. J. Kelly. Pp. 12, illustrated, paper, 4x9 in.; June 14, 1907.

Lidgerwood Manufacturing Company, 96 Liberty street, New York. Bulletin No. 21. Slip Drum Electric Winches for Hauling in Car Floats. Pp. 4, illustrated, paper, 6½x11 in.

C. O. Bartlett & Snow Company, Cleveland, Ohio. Catalog No. 18. Elevating, Conveying, Mining and Milling Machinery. Pp. 324, indexed, illustrated, paper, 6x9 in.; 1908.

The Nelson Valve Company, Philadelphia, Penn. Catalog H. Improved Gate and Globe Valves for Steam, Water, Gas, Air, Ammonia, etc. Pp. 52, indexed, illustrated, paper, 6x9¼ in.; 1907.

Lazier Gas Engine Company, 190 Main street, Buffalo, N. Y. Lazier Vertical Gas Engines Multiple Cylinder Type, also Blueprints on the Lazier Gas Engine. Pp. 12, illustrated, paper, 7½x10½ in.; 1907.

Chain Belt Company, Park street and Eleventh avenue, Milwaukee, Wis. General Catalog No. 35. Elevating, Conveying and Power Transmitting Machinery. Pp. 287, indexed, illustrated, paper, 6x9 in.; 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin 1514. The Type "OB" Pneumatic Governor. Bulletin 1515. Type "J" Emergency Valve for Straight Air Brake Equipments. Pp. 8, illustrated, paper, 8x10½ in.; September, 1907.

Gould Storage Battery Company, 341-347 Fifth avenue, New York. Bulletin No. 8. An Interurban Railway Distribution System. Pp. 9. Bulletin No. 9. Storage Batteries on Alternating Current Systems. Pp. 11, illustrated, paper. 8x10½ in.; 1907. The Gould Battery. Pp. 20, illustrated, paper, 6x9 in.

Construction News

Jewitt, Texas—The Trinity & Brazos Valley Railroad Company is said to be preparing to open a lignite mine. P. G. Burns, Fort Worth, Texas, is chief engineer.

Mount Sterling, Kentucky—The Southern Coal and Coke Company is preparing to open a coal mine on a tract recently bought in Knox county. James M. Bigstaff, Mount Sterling, is president.

Grafton, West Virginia—The McGraw Coal Company, it is said, will build a large coal tipple and storage plant, with appliances for shipping coal by river. The company's address is at Simpson, West Virginia.

Middlesboro, Kentucky—The Chenova coal mines have been sold to Pennsylvania parties who will put in new equipment and operate the mines. S. S. Seligman, Mahanoy City, Penn., represents the purchasers.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Dec. 18.—The Western Zinc Company, which owns the Silverado mine in Orange county, is in financial trouble and the creditors have begun looking into its affairs, a committee having been appointed for the purpose this week. It is reported that the company owes some $120,000 while the assets are doubtful. The company some time since purchased the Reynolds chemical works near San Francisco, began work in manufacturing acids, zinc sulphate, etc., and many thousands of dollars have been expended on the plant and in experiments in some new process which was to be used. The report of the creditors on the condition of the company's affairs has not yet been prepared.

The bond held by the Guggenheims on the Golinsky group of copper mines in Shasta county expired Dec. 2, but it has been since renewed in the name of the Selby Smelting and Lead company. Under the old bond a few thousand tons of ore were taken out and shipped to the smelter at Garfield, Utah; and a mile long electric road was built to facilitate shipment of ore. Under the new bond active development work must continue. During the year the title to the claim was cleared up by a suit in the Superior Court, which settled the fact that Mrs. Goss, of San Francisco, had no claim to the ground or any part of it. The mines are so called because Bernhard Golinsky, the pioneer of Kennett, Shasta county, was the original owner.

The Black Oak mine, one of the producers of Soulsbyville, in Tuolumne county, has been bonded to a syndicate of practical men that will start business at once. The negotiations were conducted by Sylvester Knapp, an old miner and a practical man. The mine has, in its day, been a large producer. The gold ore found carries considerable silver, with some galena, and has never been very easy to treat to a high percentage of recovery.

A hearing is being held in this city in the suit brought by the Government against the Central Pacific Railroad Company to set aside the patent to a certain section of land in Nevada county, near Cisco. The application for patent was made in 1886 and the patent issued in 1901, under the act of 1862, which granted to the railroad company each alternate section on either side of the right of way, providing the land was non-mineral. It is the contention of the Government that this selection in question is mineral land, and that it was so known long prior to 1886, when the railroad people applied for patent. The land is described by witnesses who are familiar with the location as being a steep mountain side, ribbed with out-cropping veins of mineral, and witnesses testified that several claims had been located on this section and worked prior to 1886, and that a mill had been erected for the treatment of ores taken out, and that assays received from the rock went from $25 to $30 to the ton. The suit is being watched with great interest as there are very many similar instances where the railroad obtained patent to valuable mineral ground in this State, though the law explicitly prohibits taking up mineral land, on railroad patents. The California Miners' Association for some years carried on a hard fight to prevent this trespass on the prospector's domain, but without success, for the railroad companies continued the practice. As a result these companies hold thousands of acres of mineral lands, to which they have no legal right.

Salt Lake City

Dec. 21—Whether or not the Utah Consolidated will continue the operation of its smelter another 15 months will probably be decided within the next few days. The farmers who were interested in the trial of the late smoke case met in a mass meeting recently and voted to allow the latter to continue, or rather to petition the court for a modified decree, provided they were paid a bonus of $150,000 and $25,000 additional as an attorney's fee. The smelting company made a counter proposition by expressing a willingness to pay $100,000 as a bonus and settle any damages that might be caused through the operation of the smelter along the lines customary in the past. At this time the matter is in the hands of the farmers' executive committee. In the meantime, the company has filed a petition for a writ of *certiorari* in the United States Supreme Court.

Three sections of the Boston Consolidated mill at Garfield are ready for operation. The ore bins have been filled and the electric power connections will have been made by Dec. 27, on which date it is expected at least one section of the plant will go into commission.

The Utah Copper Company is out with a statement that it made 2,705,000 lb. of copper during November, which netted about $120,000, an increase of about $30,000.

The smelter of the Bingham Consolidated will be out of commission within a week. It is down to the last furnace and practically all the ores about the premises have been used up.

Rapid progress is being made with the construction of the new zinc concentrator at Park City, in which the zinc ores of the Daly Judge mine are to be treated. The buildings are under cover and a portion of the equipment is on the ground.

The producers of Park City are seriously considering a proposition to close their mines on Jan. 1, owing to the low prices of the metals. The same condition exists in the Tintic district and it is possible that some of the mines there will go out of commission, or else make a sweeping reduction in wages. In Park City the principal producers are the Silver King, Daly West and Daly Judge.

The producers and operators of Pioche, Nevada, have notified their employees that wages will be reduced on Jan. 1. The reduction, in some cases, will be as high as 20 per cent. Miners have been getting $4.50 and they are to be cut down to $3.50 per day.

The Black Rock Copper and Gold Mining Company is plaintiff in a case filed in the District Court against Secretary of State Charles S. Tingey, the object of which is to test the validity of the license tax law passed by the last legislature.

Shareholders of the Sevier Consolidated Mining Company, which is in financial distress, having debts of something over $200,000, have undertaken to raise funds for an expert examination of the company's property situated in Piute county, by means of a voluntary assessment of 2c. a share. The property has power, mine and mill equipment which cost $218,000 in all.

Denver

Dec. 21—The engineers for the Central Colorado Power Company announce that as soon as the weather moderates (which probably means spring), they will put back to work the 2000 men whom they laid off recently. This was chiefly caused, it is said, by the closing of the Knickerbocker Trust Company, which concern carried the power company's cash balance. The Central Colorado Power Company was organized about a year ago, with a capitalization of $22,500,000, and the bond issue was over-subscribed. The great power plants which they are building are at Gore cañon, on the Moffat road, and at

Glenwood Springs, and are intended to supply the towns and cities of Colorado with light and power.

The deep drainage, or as it is now called, the Roosevelt tunnel, of Cripple Creek, is being driven by Mr. Bainbridge, superintendent of El Paso mine, until such time as a new contract can be let, the old one having been forfeited by El Paso Company.

This week, Mr. Milliken, president of the Golden Cycle company, gave a banquet at Cripple Creek to 134 guests, on the occasion of the re-opening of the Golden Cycle mill.

In the now celebrated suit of Doyle *vs.* Burns, to recover $47,000, the value of stock in the Portland Gold Mining Company, which the former alleges was withheld from him, Doyle has been granted a re-hearing. They have each obtained judgments during the past six years. The case now comes up in the Federal District Court at Council Bluffs, Iowa.

In the suit of the Portland Gold Mining Company against Stratton's Independence, Ltd., to recover $100,000, the value of ore said to have been taken out of the former company's ground by the latter's lessees, was decided by the Court of Appeals in favor of Stratton's Independence, it being held that the company was not liable or responsible for the trespass of its lessees.

One of the greatest drawbacks in the Cripple Creek district has been in outrageous royalties demanded from lessees, and owners seem never to be able to realize that they, as well as the lessees, and the district, would profit greatly if the tribute was lowered. Now to add to the hardship of the lessee, a company has demanded a cash bonus, and announces that the highest bidder will get the plum. No wonder that there is "high grading" when the unfortunate tributer has to pay thus through the nose for the privilege of discovering, extracting and marketing the ore for the owner, who does nothing but furnish the territory.

The Western Federation of Miners has declared the Cripple Creek strike at an end. This is the longest strike on record, having lasted four years. This simplifies the labor situation, as we presume that the Federation members can now work in the district without being tabooed in other camps where it predominates. Heretofore any Federation miner who took out a Mine-Owners' Association card disqualified himself for employment in any other camp where the Federation held sway.

It is said that a great many miners are returning to Cripple Creek from the Nevada trouble area.

Owing, it is said, to the hardness of the rock encountered, El Paso Consolidated Company, which has the contract for boring the Cripple Creek deep drainage tunnel, has been unable to make the 250 ft. a month called for, and has notified the Drainage Tunnel Company that unless the forfeiture and time clauses are eliminated, it will surrender the contract. The ever-belligerent Jas. F. Burns, who is an owner in El Paso Company, has notified the company that it has no right to be taking contracts for driving tunnels, and will endeavor to stop it from continuing the work. What the result will be has not transpired, but it is apparently certain that the drainage tunnel will continue to be driven by someone, as the money for that purpose is all subscribed.

Following the connection with the Saratoga mine, the Old Town, another of the early big gold producers of Gilpin county, has been connected with the Newhouse Tunnel by a lateral of 4300 ft., and a shaft of 2186 ft. The Old Town is credited with a production of ore to the value of $1,787,000 above the fifteenth level. While the tunnel is now, one may say, under a net-work of mines which were great gold producers in days past, not many of them, or the owners thereof, are rich enough to stand the heavy expense of making such connections at depths of from 1500 to 2000 ft. below the surface.

In the matter of indictments for fraud in coal and timber-land entries in the Federal Court this week, Judge Lewis, in answer to a question put by the Government counsel, remarked as follows: "In the absence of a prohibition in the coal-land statute of the right to alienate the title thereafter to be acquired by the entryman, why is not a contract by an entryman to transfer his title conditioned upon the future obtaining of the title by him, absolutely good and valid? The common law was opposed to the restraint of alienation of property, and such right of alienation is considered as existing in the absence of a statute expressly prohibiting it." He has thus confirmed the general opinion held all over the State, which is that the coal-land indictments will not hold water; that they were, for the most part, unwarranted and unjustifiable, and that they entailed needless expense and humiliation on a number of our best citizens, beside retarding the development of the coalfields, and restricting the supply of fuel, of which there is now such a shortage in the Western States.

Henry E. Wood & Co., of Denver, whose well-known ore testing plant at South Denver was destroyed by fire last July, have erected a fine new plant, in a building 140x40 ft., of brick construction, iron roof, with electric power, etc. One-half of the new plant is completed, and experimental work has been going on in it for over a month. The heavy portion of the mill for commercial work is progressing slowly on account of the financial situation. It is interesting to note that in 1893 it was observed that the ore-testing business received a great impetus; present indications are the same for the present period of financial depression.

Scranton

The Maxwell breaker, Hazleton, which has been left idle for the past six months, has resumed operations after a thorough renovation. New machinery has been installed.

David Tillot, a pioneer coal operator of Hazleton, died last week, aged 75 years. He was born in Wales and was the first to open the Royal Oak colliery and shoveled the first piece of coal from that operation.

William Cosgrove, engineer at No. 2 Heidelberg colliery, of the Lehigh Coal ompany, near Wilkesbarre, performed a brave feat recently. While hoisting six miners in the cage the engine house collapsed, but Cosgrove stuck to the throttle until the men were safely landed and then made his escape just as the roof fell on the spot on which he had been standing.

The Philadelphia & Reading Coal and Iron Company has expended $3,000,000 during the last three years in the development of the Pottsville coal basin. Equally large investments are to be made in the rich Minersville territory.

A settlement has been effected of the trouble between the Lehigh Valley Coal Company and the miners employed at the Twin shaft, Pittston. Recently the company installed a new and larger mine car and previously the men had been paid at the rate of 98c. a car. For the new car which measures 8 cu.ft. the company announced that it would pay $1.04 per car, which the men refused to accept. After a conference this was raised to $1.07, which has been accepted by the men.

The new breaker of the Excelsior colliery, Hazleton, has been completed and work will be resumed this week.

Toronto

Dec. 6—The Shareholders Protective Association has been organized here, as a means by which investors can protect themselves from being duped by mining swindlers. The association undertakes to see that the provisions of the law regarding the issue of prospectuses and the flotation of stock are complied with, to investigate the affairs of companies, and to prosecute offenders with a view of recovering money received for stock through fraud or misrepresentation.

Mining operations will be actively continued by the leading Cobalt companies throughout the winter. At 35 mines in the district the number of men now at work is 1846, and the employees of other companies, not included in the estimate, will bring the figures up to 2000 or more.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Miami Copper Company—The General Development Company (Lewisohns) has organized this company, capital stock $3,000,000, to take over the Alsdorf property near Globe. A large body of ore similar to that of Ely, Nev., has been developed under the general direction of J. Parke Channing.

GRAHAM COUNTY

Arizona Copper Mining Company Ltd.—On Dec. 11 the machinists and smelter men walked out. So far the concentrators have not been affected by the strike. The concentrates are being piled up until the smelter starts.

Detroit Copper—The company has installed a new electric hoist which is used to elevate timber and steel from the surface level of the Arizona Central mine to the upper adits of the Copper Mountain mine. Heretofore these materials were taken up on burros but since so much timber is being used this method proved to be too expensive. The new airlift used for elevating the tail water of the mill has been in operation for two weeks. It requires so much air to operate it that it taxed the compressor to such an extent as to necessitate the abandonment of the air drills in the Old Yankee mine. If the air lift proves to be economical the management expect to replace the several bucket elevators with it.

Shannon Copper Company—The company's smelter at Clifton is closed down on account of the strike of its employees on Dec. 11. The authorities have not stated how they expect to handle the situation.

California

Atolia Mining Company—This company, of San Francisco, operating tungsten mines at Randsburg, has closed them down indefinitely.

AMADOR COUNTY

Central Eureka—This company at Sutter Creek is endeavoring to bring about an arrangement with Mrs. Hetty Green so that the old Eureka mine, owned by her, and idle over 30 years, may be re-opened. Since it was burned out 30 years ago no work has ever been done upon it, though it has a record of an output of many millions.

BUTTE COUNTY

Boston Hill—This mine, idle for two years, is about to be re-opened, and the ditches and flumes are being repaired. It used to be known as the Big Butte.

W. P. Lynch Mining Company—After two years' work this company has completed its tunnel and has tapped the channel in the old Kimshew district.

CALAVERAS COUNTY

Calaveras Gold Dredging Company—This company has ceased operations and placed the dredge in a sheltered spot until the rush of the winter floods is over.

FRESNO COUNTY

Dredges—Beeson & Fallon and others are doing preparatory work on the San Joaquin river at Pollasky, where they will shortly install a suction dredge.

INYO COUNTY

Cactus Flat—At this camp Elder & Thorndyke have found a 5-ft. ledge of good ore in the Forget mine.

Tecopa Gunsight Mining Company—This company has been organized at Rhyolite, Nevada, with F. H. Stickney as president, and B. F. Taylor as secretary, to work 13 claims adjoining the properties of the Tecopa Consolidated Mining Company at Tecopa.

MONO COUNTY

Mono Consolidated Copper Company—Good copper ore is being taken from this property, and a large body has been uncovered.

Pittsburg Liberty Mining Company—Ore is being hauled from this mine to the mill at Masonic, by teams.

NEVADA COUNTY

Banner—At this mine, Nevada City, operations have been resumed with 16 miners at work. A good ledge has been found on the 900 level. The mine has recently been pumped out and re-opened.

Giant King—This mine at Washington is to resume operations, and a new compressor is being installed. C. M. Carter is superintendent.

Grey Eagle—At this mine, Maybert, A. Charronat, superintendent, surveys are being made preparatory to sinking a new shaft.

Idaho-Maryland Mining Company—On the 500 level of this property at Grass Valley, a body of rich ore has been uncovered.

Independent—C. C. Derby, superintendent of this mine near Nevada City, after having it pumped out and examined, is about to do extensive development work.

Sultana Mining Company—This company at Grass Valley is preparing to put in an electric power plant of its own, instead of purchasing power from the Bay Counties Power Company.

PLUMAS COUNTY

New York—At this mine, in Washington Hill ridge, George Sanborn, for a new company, is opening the old tunnel, and it will be extended to determine whether or not there is a back channel.

SAN BERNARDINO COUNTY

Crackerjack Bonanza Gold Mining Company—This company, in Crackerjack district, has recently been shipping some high-grade ore to the Satl Lake smelters. A custom mill is shortly expected in the camp, when the company will utilize its milling ore.

SHASTA COUNTY

Chrome mines—The Shotgun Creek chrome mines Nos. 1 and 2 have been sold by D. G. Reed to the Noble Electric Steel Company, which is opening a steel plant at Heroult on Pit river. This company has also purchased the following chrome mines: Carisbrook, Chrome No. 1, Chrome No. 2, and Mount Shasta.

Tedoe Consolidated Mining Company—This company has been organized in Woodland, Yolo county, to work a group of copper claims recently located by Robert James Moore, in the Shasta copper belt, 30 miles northwest of Red Bluff.

SIERRA COUNTY

Alaska—The strike of specimen rock in this property at Pike City was made in the Casserly vein, which is separate from the Alaska ledge proper.

Croesus Mining Company—A rich pocket has been struck in this mine at a place where the ledge is unusually wide. The ore is being sacked as fast as mined. The pocket was found at 1000 ft. vertical depth and 2000 ft. from the mouth of the lowest tunnel.

SISKIYOU COUNTY

The Klamath River Gold Mining Company has got through with its several years of litigation. Four years ago this company took an option on what is known as the Garvey bar, situated in the Klamath river, 12 miles below Hornbrook,

Siskiyou county. The property consists of 80 acres of proved gravel and was sold to this company for $12,000, to be paid in instalments. Before the first payment became due the title was found to be clouded, and during the clearing of the title the corporation was prospecting the property. On Aug. 31, 1904, the channel was found. After that a number of suits were contested. The litigation promised to be long drawn out, but finally a compromise was effected whereby the corporation is said to have paid to Mr. Garvey the cash sum of $10,000, for which all right, title and interest were vested in the company. This is a gold-dredging company incorporated under the laws of California. The ordinary floating dredge cannot work on the Klamath river, but the company has a patented steam scraper which works from the surface and will handle almost any kind of gravel that it is possible to work with pick and shovel. Two dredges are now being built.

Fred Beaudry Group—At these hydraulic claims on the south fork of Scott river, men are repairing the ditches and flumes so as to work two giants.

Highland—This mine in the Salmon range will be worked all winter by the owner, M. J. Ward, of San Francisco. Supplies have all been packed in.

TUOLUMNE COUNTY

Gravel—Work has been commenced to drain the pond in the meadow in the Barber place near Confidence, recently purchased by Mrs. W. H. Scott. The pond is supposed to cover an old gravel channel. An old tunnel is also being reopened with a view of finding the gravel channels.

Colorado

LAKE COUNTY—LEADVILLE

Coon Valley—With the work already done on the ore that was opened in this property, Rock hill, a few weeks ago, the mine bids fair to become one of the heaviest shippers of lead ore in the district. So far it is known that the orebody is 15 ft. high, depth, width and length unknown. Work has proved that it is the extension of the Reindeer oreshoot. On account of the present low price of lead no ore is being shipped and only development work is being carried on.

Delaware—In this shaft, Rock hill, drifting from the bottom of the shaft, 700 ft., has been started through the blue lime. The orebody was found in the Crecentia to the southwest, but dipped so rapidly it was necessary to sink another shaft.

Eagle Group—The work recently accomplished on this group, Big English gulch, shows that the ore carries good values in gold as well as in copper. The vein is about 6 ft. wide, but will not hold up to the sample assays; through the body is a rich streak from which the samples were taken.

Langlola—This company, which controls the R. A. M., Iron hill, is working at the 1100-ft. level, and is carrying on an active campaign of development work to catch the large zinc body that is in the territory.

Penn—Hanifen & Reynolds leasing on this property, Breece hill, are shipping 200 tons daily of oxidized iron, and doing considerable development work in new territory. The same parties are working the Louisville, Iron hill, from the Yak tunnel, and sending out about 100 tons daily of sulphides. It is their intention to continue at work.

Yak Tunnel—An important consolidation was recently consummated, whereby the gold-belt section will receive considerable impetus. The property consists of the Elk, Deer, Donovan, Tenderfoot, Antelope, etc., all lying east of the Little Jonny. Preparations are now being made to drive the tunnel from Little Jonny No. 4 shaft into this new territory to develop the different claims. The property has been taken over by the Leadville Exploration and Mining Company, capitalized at $1,000,000. Myron T. Herrick, ex-governor of Ohio, is at the head of the enterprise, and Walter W. Davis, of Leadville, is general manager. While the tunnel is being driven to develop the properties at greater depth, for the present the upper levels of the different claims will be worked. When the tunnel reaches the territory it is probable that one of the shafts will be sunk to make connections.

TELLER COUNTY—CRIPPLE CREEK.

The annnouncement of the leaders of the Western Federation of Miners that the miners' strike, which was called in 1903 in this district has been called off, is received in the district as a joke. There has been absolutely no evidence of a strike here for the past three years. The probable reason for this move on the part of the Federation is to permit its members to return to the district, to get work if possible. A number of them are already coming, but will not be able to obtain employment as no recommendation card will be issued to them. Practically all of the mines in the district are in unison with the Mine Owners' Association and will not employ men who have not cards. There is a considerable amount of work in progress at present, but there is no scarcity of competent men, and the indications are that the Union will not again get a foothold in this district. There is no truth in the rumor that the card system will be abolished, and the labor situation is very generally satisfactory.

Drainage Tunnel—The progress on this enterprise is not as rapid as could be desired owing to the hardness of the rock. Mr. Bainbridge, manager for the contractors, has notified the tunnel committee that unless the forfeiture clause which provides for the completion of 250 ft. per month is abrogated, El Paso Company will be obliged to throw up the contract.

Findley Consolidated—This property has recently resumed work, and is again on the shipping list. This was one of the properties that closed down when the Cycle mill burned down last summer. It is situated on Bull hill and is a heavy producer.

El Paso Consolidated—The property of this company is being examined by the prospective leasers. The leases are to be let to the highest bidders, the bids being opened December 21. The property is divided into 26 blocks, all above the present water level. The royalites to be asked range from 15 to 50 per cent. At least 52 shifts of work must be done on each block. The company will do the hoisting, sharpen steel and furnish air at reasonable cost to lessee. The bids are on the amount of bonus to be paid for the lease. One third of this bonus is to be paid at the time the lease is let and the other two-thirds out of one-half the profits of the lease.

Idaho

SHOSHONE COUNTY

Carney Copper Company—At the annual meeting in Mullan, last week, J. L. Martin was chosen president; W. D. Green, vice-president; C. D. Miller, secretary and treasurer. No. 2 tunnel is now in 170 ft., and a contract has been let to extend it 300 ft. further, at $12 per foot. The company owns eight claims on Stevens peak, 3½ miles from Mullan.

Daisy—At the annual meeting, Dec. 11, Joseph Carson was chosen president; James A. Bean, vice-president; C. D. Miller, secretary and treasurer. All are residents of Mullan.

Silver Eagle—At a meeting of the stockholders in Wallace, last week, John Hogas was elected president; Claus E. Anderson, vice-president; Allen J. Olson, secretary and treasurer. Progress was reported in development.

Indiana

At the Conference held in Indianapolis between the operators and representatives of the United Mine Workers of the Central Competitive field, comprising Ohio, Illinois, Indiana and western Pennsylvania, Dec. 19 and 20, the matter of restoring the interstate agreement was thoroughly discussed. The State agreements made two years ago will expire next April, and the miners are strongly in favor of restoring the interstate agreement. The meeting held during the past week was an adjourned meeting. Few of those present at the meeting during the past week believed that the meeting would adjourn without taking favorable action, but such was the case.

At the close of the first day's discussion a committee was appointed to take up several propositions that had been submitted and report the next morning. The committee reported that it had been unable to reach an agreement. Thereupon the Illinois operators demanded that several concessions be made before they would consent to a re-establishment of the interstate joint conference. One of the demands was that there should be a change from the mine-run system to the double standard, which gives the operators the right to pay under the mine-run system or the screened-coal system, depending on conditions. The other was that there be a readjustment of the differential between pick and machine mining. Representatives of the miners argued that the present meeting was not the place to take up these matters.

One of the propositions submitted to the committee was that the interstate conference should be restored and the conference held in this city Jan. 30. Another was to refer the matter of a re-establishment of the joint conference to a special committee to report Feb. 18. The third proposition was that the present meeting adjourn to Feb. 25 and at that time take up the question of whether or not there should be a restoration of the interstate joint conference. The latter proposition prevailed and the meeting adjourned.

Michigan

COPPER

Isle Royale—Diamond drilling is being done at the Hussey-Howe tract, to cut the Baltic lode, if possible. This tract was purchased by the Isle Royale company during the year.

Lake—A diamond drill core, taken from a depth of 450 ft., shows the same rich formation found on the surface in trenching.

Michigan—At "C" shaft a station is being cut at the tenth level, and as soon as this is completed, sinking will be resumed. Drifting on the sixth, seventh, eighth and ninth levels is showing well in shot copper. The lode is not very wide, but is well defined and uniform. At "B" shaft stoping is being done at the second and third levels. At "A" the "Calico" lode is also being worked in the eighth, ninth, tenth and eleventh levels, and is showing good copper rock. The new shaft and rock house at "C" shaft will be completed and in operation early in 1908. This will greatly facilitate the handling of rock, for the output coming from this shaft is now being hoisted from "B" shaft. A crosscut is being driven from the seventh level and is now in about 15 ft. on the lode. Drifts at the fourth, fifth and sixth levels are being extended, and the formation is becoming more settled and carrying more copper in the stamp rock, including considerable barrel and mass copper. A new hoist has recently been installed and this additional power will take care of operations for some time to come.

Missouri

ST. FRANCOIS COUNTY

St. Joe Lead Company—This company has declared its usual quarterly dividend of 1½ per cent., and the Doe Run Company its usual monthly dividend of ½ per cent.; the latter will hereafter declare its dividends quarterly. Both these companies have reduced their output 50 per cent. by putting all the departments on half time, but no cut in wages has yet been made.

Montana

BUTTE DISTRICT

It had been the intention of the Amalgamated directors to close all the mines and smelters until there was a decided improvement in the copper market, but John Gillis, general manager of the company's affairs in Montana, suggested the idea of concentrating all operations in the Boston & Montana, and the suggestion was accepted, it being represented that the Boston & Montana could be operated at a small profit. The normal capacity of the Washoe smelter is 10,000 tons of ore per day and an output of about 18,000,000 lb. of copper per month. When the production of the mines and smelters of the Amalgamated was cut to about 25 per cent. of the normal, it was ascertained that the Washoe could not be run at that rate without a loss. The Great Falls smelter of the Boston & Montana being a smaller plant, it is claimed, can be operated more economically on a small output. For several months the two smelters have produced between 7,500,000 and 8,000,000 lb. copper per month, and it is proposed to produce about the same amount with the Great Falls smelteer, but it will likely be a month before that quantity can be turned out.

Amazon-Butte—This company has stopped development work on its property on the east side of the Butte district. Lack of funds is the cause. The company carried on work for several months by levying assessments on the stock, but the money stringency made further assessments inadvisable. The company quit work with a fine showing on the 300-ft. level.

Anaconda—All the mines of this company have been closed, so far as ore production is concerned. A number of men are retained at each mine to attend to repairs and keep the pumps working.

Boston & Montana—In accord with the promise of Amalgamated directors when all other mines were shut down, the working force at the Boston & Montana mines is being increased. The Leonard and West Colusa mines, which were closed on account of fire for three months or more, are being re-opened and the company expects to mine about 400 tons of ore daily from each property. The fire is under control on all but three levels. The output of the Mountain View mine is to be increased from 700 to 1400 tons per day, and that of the Pennsylvania mine from 400 to 1100 tons.

Butte & Bacorn—The suspension of operations by this company was due chiefly to the failure of a Pittsburg firm, which had acted as agent for the company in the collection of subscriptions, although very little of the funds of the Butte & Bacorn were involved.

Cable Consolidated—The company has been compelled to suspend work on its mines near Anaconda because of the failure of the Fort Pitt National Bank in Pittsburg, which held all the funds of the company. Before the smelters ceased buying copper ore the company was able to meet expenses by shipping copper ore while searching for the gold orebodies, but when that source of revenue was cut off it had to call on the treasury.

North Butte—The position of this company in the shut-down is somewhat peculiar. It has a contract with the Washoe smelter for the treatment of its ore and it is naturally presumed that there must be a clause in the contract to protect it against a shut-down. If it has such protection the company is evidently not seeking to enforce it, but on the contrary, appears to be in perfect harmony with the actions of the Amalgamated. The North Butte mines have been shut down except for development work.

Original—The mines of this company are run on a 60 per cent. reduction of output.

Montana

MISSOULA COUNTY

Swastika—In this mine, on Four Mile creek, the working tunnel is in 248 ft., and another tunnel has been started at a lower level. A carload of good copper ore, which had been taken out in development, was recently shipped to Salt Lake.

North Carolina

STANLEY COUNTY

Parker Gold Mine—This old mine has been re-opened and is turning out good quantities of ore. The mine has been worked intermittently since 1840. Frank Loyd is manager.

STOKES COUNTY

Mica Mine—L. E. Simmons, of Marion, has an option on mica privileges near Pilot mountain. The deposit is to be exploited at an early date.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Production for the first half-year was 31,740 tons, making up a total to the end of the first week of December, 117,668

tons. A local estimate of the average value of all this product is $100 per ton.

Output marketed in the first week of this month chiefly came from the Mohawk mine and the Begole and Mohawk-Combination leases on Consolidated ground, the respective contributions being 163 tons, 957 tons and 690 tons. Both the Mohawk-Combination and the Begole leases have now expired.

Even though not a pound of ore were shipped in the remaining weeks of this month the record for the last half of 1907 to date, 85,928 tons, means an annual rate of about 171,855 tons, The principal producing companies at Goldfield propose erecting mills and cyanide plants at Goldfield early in the new year in order to treat the immense reserves of milling ore now developed in the mines.

The Share Market—At the Goldfield Stock Exchange, 98 different mining companies recorded sales during the week ending Dec. 8, 1906. Forty-three such securities were active on the Goldfield Exchange during the week ending Dec. 7, 1906. Twenty-four of these recorded sales on that exchange during the first week of December of both years. A comparison of prices for both periods shows that every security traded in during the initial week of December of both last year and this has suffered from the slump that is affecting the entire country.

According to the exchange records, the average decline in all the Goldfield stocks is 65.69 per cent. The stocks of the Red Hills, Florence, Consolidated, Florence Extension and Yellow Tiger fell off on an average of 36¼ per cent. The five heaviest slumps were suffered by Eureka, C. O. D. Mining and Leasing, Combination Fraction, Black Butte Bonanza and Goldfield Combination, their average descent in market value being 87½ per cent.

Nye County—Atwood

Goldyke—The mill is running full time on a good grade of ore, which is being broken down with electric drills. The new electric pump, about a mile from the mill, furnishes the water and is doing good work.

Gold King—The shaft is now timbered and ready for the whim, which is at Mina, and will be on the ground in a few days. The shaft is now down 45 ft. and in a fine ledge of quartz.

Pactolus—The lessees are raising some "picture" ore and have now on the dumps about 150 tons of shipping ore; also 250 tons of milling ore that will average $25 a ton.

Smuggler—The shaft is now down 60 ft. and some fine ore has been taken out in doing this work. A whim will be put up at once and sinking continued.

Nye County—Bullfrog

Tramps Consolidated—Superintendent Blackmer reports the shaft on the Denver down 265 ft. below the fourth level, and it is being continued with two shifts. It will be carried to the 300-ft. level, which will give it a depth of 600 ft. below the surface, before lateral work will be undertaken. This will probably be in the vicinity of the sulphide zone. The drift from the 200-ft. level south is in 120 ft. and a good quality of milling ore is being penetrated. Two shifts are being employed at both places.

Nye County—Manhattan

Mineral Hill—A ledge has been cut in the 200-ft. level. It is 5 ft. wide, and the first assay gave returns of $24.64 in gold. The richest part of the orebody is in the center. The sulphides at this depth show very little oxidization. The character of the ore is similar to that of the Thanksgiving and other properties on this contact vein, which has now been proved for a distance of about two miles. The Mineral Hill is the farthest east of any mine opened up at depth, and the indications are that it will be the equal of properties in the neighborhood of the Mustang and Thanksgiving. This strike on the Mineral Hill is of value to the district, as it proves that the contact vein which on the west has been cut in the Mustang and Thanksgiving will produce mines farther east as well. If the vein in the Mineral Hill makes good, as it now appears will be the case, the eastern section of Manhattan's mineral belt will assume greater importance.

Nye County—Tonopah

Extension—Donald B. Gillies, president of the Tonopah Extension Company, announces that this company will immediately commence the erection of a mill and cyanide plant on the mine. The mill will be erected as close to the mine as possible, so that the ore can be carried by belt conveyers direct from the collar of the shaft to the ore bins at the mill. The plant will be of a modified tube-mill type, combined with a new cyanide process, which eliminates concentration, although concentrating tables can be added later if found necessary. Ground will be broken for the foundations before the close of the year, and the work of construction will be pushed as rapidly as men and money can expedite operations. The work will be done under company supervision, and a large force of workmen will be employed. The new plant will be designed to profitably treat ore above $7 in value. There is now on the dump at the mine a quantity of ore, estimated at 25,000 tons, worth $18 a ton, and there are large bodies of ore in the mine running from $10 to $20 a ton, to say nothing of the big reserves of shipping ore. The physical condition of the mine was never better. Ore is being extracted from all levels, and the values are being maintained and are increasing in the western part of the mine. Good progress is being made in the north crosscut on the 1050-ft. level, which is due to intersect the ledge in February.

Midway—Operations at present are mainly confined to the cutting of a station on the new vein opened up in the north crosscut on the 840-ft. level, preparatory to sinking a winze on the orebody in an effort to develop a pay shoot. A hoist will be installed, operated by compressed air. The usual quantities of high-grade ore are being extracted from the upper levels and regular shipments of about 200 tons a week are going forward to the smelter.

Montana Tonopah—A large low-grade vein has been discovered in the Montana mine below a dacite dike intrusion which cut off the orebodies near the 600-ft. level. This find is of great importance, as, taken in conjunction with the recent discovery of a similar nature in the Midway mine, it tends to prove that Professor Spurr's theory of the Tonopah orebodies being merely "gash" veins and liable to give out at depth, is erroneous. Developments at depth in various mines on the field since Professor Spurr wrote his report, have shown that the principal veins in the lower andesite formation are strong, well-formed fissure veins. The new vein in the Montana was cut in the 760-ft. level. The new orebody is 30 ft. in width and is of milling grade. This strike will encourage other mine owners on the field to follow the example of the Midway, Extension and Montana companies and explore their ground at depth. F. L. Bosqui, designer of the mill of the Montana Tonopah, made an examination of the plant recently and expressed himself as well satisfied with its condition. It has more than made good on all its promises, and is ready to crush all the ore that can be turned out by the new find, in addition to the large quantities already blocked out in the mine.

North Star—Development work is being actively pursued on the 1250-ft. level, where the formation is looking very favorable. Ore is being extracted from the 900- and 1000-ft. levels, where the ledge is making into a good-sized body of ore of fair grade. Some ore is being sent to the Montana mill, the values averaging about $70 per ton.

Rescue—Steady development work is being carried on in this property, which is situated near the southern boundary lines of the Belmont. The north and south crosscuts on the 650-ft. level are each out about 350 ft. The formation is looking very favorable and stringers of quartz carrying good values are being encountered in both crosscuts.

West End—The usual amount of development work is being carried on in the various levels. Ore is being extracted in the stopes in the old workings above the

400-ft. level. Ore shipments are going forward to the smelters at regular intervals.

WHITE PINE COUNTY

Giroux—The recent caving-in of the Alpha shaft proves to be rather serious and will delay the beginning of regular milling by the company. There are several other shafts capable of supplying the mill with ore, but the Alpha has been largely relied on for water. Two men are imprisoned in the Alpha workings, food for whom is being supplied through one of the pipes.

New Mexico

GRANT COUNTY

San Jose Mining Company—This new company, organized under the laws of Arizona, has acquired a group of claims in the Central mining district, including the Rose of New Mexico, Hebron, Alice, Lon, Arkansas and Jim. The properties contain silver-lead deposits which it is proposed to develop on an extensive scale.

LINCOLN COUNTY

American—It is reported that this mine near Nogal, which has been in litigation several years, will pay all indebtedness on Jan. 1 and resume operations.

LUNA COUNTY

Victoria—These silver-lead mines at Gage, on the Southern Pacific, have been acquired by a new company known as the National Mining and Smelting Company. The company plans opening the mines on a large scale.

Pennsylvania

ANTHRACITE

The Lehigh Valley Coal Company will abandon the Warrior Run breaker, owing to the serious subsidences at that place and convey the coal to the Seneca breaker, Pittston, to be prepared for market. This will mean that the coal will be taken a distance of 12 miles in railroad cars.

Three hundred mine workers have left work at the West Glendower colliery, Schuylkill county, complaining that they are not sufficiently paid, according to the award of the strike commission.

South Dakota

LAWRENCE COUNTY

Homestake—In order to put its treasury in first-class condition this company has postponed the resumption of dividends until Jan. 1, when they will be resumed at the old rate of 50c. a month. The last dividend was paid on April 10, 1907, after which payments were suspended on account of the fire in the mine.

Gilt-Edge-Maid—Fire destroyed the assay office on the property at Turner with a loss of $2000 and no insurance. The building will be replaced at once.

Anaconda—About the first of 1908 this property will resume after three years' idleness. The shaft will be continued from the 200- to the 500-ft. level.

Puritan—The Kansas City owners have ordered work started again on this property in Strawberry gulch. The 75-ft. shaft will be deepened and the 30-ft. gold and silver ledge developed. The mill will be remodeled before operation.

Globe—George Pollard, of Rochford, has sold his Cannon Ball group near Lead to this company. The ground will be further developed as soon as possible.

Mogul—Manager McLaughlin announces that it is probable that the company will commence paying dividends shortly after the first of the year. The $300,000 bond issue is about to be called in with the accumulated profits now in the treasury.

PENNINGTON COUNTY

Golden Slipper—The five-stamp mill near Keystone is being repaired and the property will be operated once more. It contains high-grade gold ore. The shaft is down 300 ft., but most of the ore will come from the medium-grade ledges at the 150-ft. level.

Continental Copper—The diamond drill is being effectively used from the 500-ft. level to determine the extent of the dip of the ledge.

J. R.—Superintendent Crocker is expected back soon from his Eastern trip and the property will resume. The 250-ft. shaft will be unwatered and ore taken from the 200-ft. level where a 40-ft. quartz ledge has been opened. The ore is free-milling and will be treated by the amalgamation process in the 10-stamp mill.

Holy Terror—The re-timbering of the 1000-ft. shaft to the 400-ft. level where the water now stands is completed. The mine will be worked through the 400-ft. level. The adjoining Keystone workings will be exploited by the United Mines Company which has a bond from Charles Morgan, of East Orange, N. J. The Keystone and Holy Terror stamps are to be combined with five additional stamps, making 40 in all.

Mainstay—Just as soon as the water system now in construction is completed the work on the property at Keystone will be resumed. The working shaft is down 400 ft., and on the 200-ft. level there is a 40-ft. ledge of milling ore ready for stoping. The 30-stamp mill with its cyanide annex will probably be in operation about the first of the year.

Morning Star—Work has been started by the E. G. Chapman estate. The preliminary development has shown some extremely high-grade gold ore similar to that on the Juniper group adjoining, from which rich shipments have been made.

Utah

JUAB COUNTY

Tintic Smelting Company—Officials of this company say construction work is to be pushed rapidly and that the smelter being erected near Silver City will be ready for operation about April 1. The initial capacity will be 400 tons a day.

SALT LAKE COUNTY

Columbus Consolidated—The output from this property has been considerably curtailed lately. The next quarterly dividend will be passed.

Boston Consolidated—It is expected that the first section of the mill at Garfield will be put in operation about Jan. 1, 1908.

SUMMIT COUNTY

Wabash—This company has called on shareholders for an assessment. It is No. 29, and the amount is 12c. a share.

Daly Judge—The new electric haulage system in the mine owned by this company will soon be installed and ready for commission.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore from Cobalt for the week ending Dec. 14 were as follows: Kerr Lake (Jacobs), 61,420 lb.; McKinley-Darragh, 142,370; Nipissing, 189,650; Nova Scotia, 63,770; Right of Way, 123,690; total, 580,900 pounds.

Cobalt Lake—E. L. Fraleck, engineer, reports that the north shaft is down 60 ft. A sump will be blasted at the bottom to keep it dry while it is being sunk 50 ft. further. Shaft No. 4 is down 152 ft. and a drift beneath the lake is being started. No. 6 shaft is down 85 ft. and a drift is in 23 ft. On Dec. 10 there were 78 tons of ore sacked.

King Edward—At a meeting of the board of directors, Samuel Newhouse was succeeded, as president, by William P. Ward; A. M. Wickwire was elected to the offices of vice-president and secretary in place of N. A. Egbert, and John Josten, treasurer of the Nipissing Mines Company, was elected to a similar position in the King Edward. The three new officers, together with J. H. Susmann, an official of several Lewisohn properties, constitute the new board of directors. The other retiring members are: T. M. T. Raborg and R. L. Moffatt.

Silver Leaf—A fine calcite vein was discovered last week, making four veins at the bottom of the shaft, two of which are rich in native silver, and two calcite with silver contents. The shaft is making a lot of water, which retards sinking.

Haileybury Silver Mining Company—This company has taken over the Mayhew-Brough property, on which there have lately been promising discoveries, including a cobalt-niccolite lead from 6 to 12 in. wide on the surface, which assays as high as 750 oz. silver to the ton. It has been traced for several hundred feet on the surface. A steam plant is ready for installation.

Trethewey Mine—W. R. McNaughton, a well-known mining man from Nova Scotia, has been appointed manager.

ONTARIO—STURGEON LAKE DISTRICT

St. Anthony—H. A. Walport, manager, has brought to Port Arthur a gold brick valued at $2000, the product of a 12 days' run of the 10-stamp mill on this gold property.

SASKATCHEWAN — EAGLE LAKE DISTRICT

Provincial Coal Mine—Preparations are being made for the opening of this mine by the provincial Government of Saskatchewan. Two carloads of machinery have been ordered and material forwarded from Saskatoon. It is expected that the first coal will be mined by Feb. 1 next.

YUKON

Yukon Basin Gold Dredging Company—This company has acquired control of the Ogilvie Dredging Company and has ordered a dredge with a capacity of 2500 cu.yd. a day, to be delivered at White Horse this winter. It will be operated on the Stewart river.

Mexico

AGUASCALIENTES

Asientos—Shipments from this district and from Tepezala have fallen from a rate of about 80,000 tons per year to less than a third of that amount as the result of the low metal prices. At the mines of the Aguascalientes Metal Company, formerly one of the heaviest producers of the district, no work is now being done except that of pumping. The Compañia Minera La Fortuna, at Tepezala, still has a force of men at work extracting ore for shipment, but all development and dead work has been stopped. The Asientos Copper Company continues its shipments to the Aguascalientes smelter, and is installing a hoisting plant and opening up the known orebodies, preparatory to heavy production when the price of copper recovers. The Compañia Minera El Misterio y Anexas is extracting copper ore, but is storing it at the mine, also in anticipation of higher prices for the metal. The Minas Tepezalanas, belonging to the Guggenheim interests, were closed for several weeks, and the opportunity taken advantage of to do needed repairing and adjusting. These mines have now resumed full operations. The Santa Francisca, also a Guggenheim property, is still out of commission, ore extraction not having been resumed since the disastrous underground fire of last summer. The Compañia Minera El Tabor y Anexas has a strong vein of lead carbonates carrying silver and gold, which is being shipped to the plant of the Compañia Metalurgica Mexicana at San Luis Potosi.

CHIHUAHUA

The refusal of the ore buyers in Parral to receive ore has resulted in a shutdown of nearly all the mines in the district except the Palmillo, and this is doing little work beyond straightening out some old shafts and cleaning out drifts. In the Santa Barbara district wages have been reduced and many miners are leaving.

Chihuahua—The shaft of this mine in the Santa Eulalia district is 1900 ft. deep and crosscuts from the 1000-ft. level down have run into bodies of silver-lead carbonate ore. Below the 1500-ft. level the lead occurs in the form of galena. The shaft of the Potosi mine, owned by the same company, is 1700 ft. deep and has also developed silver-lead carbonate and sulphide ores. The shaft is equipped with a steel head-frame, a double-drum steam hoist, and a Leyner air compressor.

Rosario Mining and Smelting Company—This company has obtained a concession from Governor Sanchez for a smelter of 30 tons daily capacity at its property in the Urique district, and for a dam for power purposes on the Urique river, with exemption from taxes for ten years.

GUANAJUATO

Guanajuato Reduction and Mining Company—The mill of this company is now operating 160 stamps, the addition of 80 new stamps having been completed. The Guanajuato Consolidated has 80 stamps running.

HIDALGO

Pachuca—A prominent mine operator of Pachuca recently reported in Mexico City that so far no shutdowns have occurred in the Pachuca district, nearly all the mines continuing to ship ore to Monterey and Aguascalientes. Among the shipping mines are the Santa Gertrudis, La Blanca, San Rafael, El Bonda and the Real del Monte. The Loretto mill of the Real del Monte company is running its full force night and day, operating 30 cyanide tanks, 40 stamps and mills. The new Guerrero mill is expected to be in operation within two months.

JALISCO

Barrillas—This property, situated in the Bautista district near Autlan, has been sold to the Compañia Minera Francisca of Mexico City. In the Bautista mine, a neighboring property, the force has been increased to 200 men.

Expectativa—A controlling interest in this mine, 10 miles northwest of Ameca, has been bought by W. R. Ramsdell, of Guadalajara, president of the Casados and Tenemache mining companies.

OAXACA

El Socorro—At the 100-ft. level of the new shaft, sunk for the purpose of cutting the vein at the 200-ft. level, an unsuspected ore shoot was encountered. The body is 4 ft. wide.

SONORA

Douglas Copper Company—The smelting furnace at Fundicion will be blown in soon after Jan. 1. A general custom smelting business will be done as well as smelting the ore of the Anita mines of the company. The matte will be shipped to the Nichols Chemical Company, New York.

TAMAULIPAS

San José—This mine, owned by the San Carlos Copper Company, has been shut down, throwing 600 men out of employment. The railroad operated by the company will continue in operation.

Chile

A strike which started recently in the nitrate mines of the Tarapaca district has extended until it is reported that over 8000 men are out, and work in the nitrate mines and *oficinas* is entirely stopped. The strikers are inclined to be violent, and the latest news is that the Chilean Government has sent warships and troops to Iquique, the chief nitrate port, to quell the disturbances.

Great Britain

Imports of iron and steel and of machinery into Great Britain for the 10 months ended Oct. 31 were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£7,234,753	£5,873,421	D.£1,361,332
Machinery.....	4,346,874	4,513,766	I. 166,892
Total.....	£11,581,627	£10,387,187	D.£1,194,440

The total quantities of iron and steel were 1,066,446 tons in 1906, and 743,755 tons in 1907; a decrease of 322,691 tons.

Imports of iron ores into Great Britain for the 10 months were, in metric tons:

	1906.	1907.	Changes.
Manganiferous ores.	271,583	260,938	D. 10,645
Iron ores.....	6,429,514	6,308,368	D. 121,146
Total.	6,701,097	6,569,306	D. 131,791

Of the imports this year 207,930 tons manganiferous ore and 4,765,587 tons iron ore were from Spain.

Africa

TRANSVAAL

November gold production is cabled as 549,000 oz. fine, being 4553 oz. less than in October. This makes the total for the 11 months ended Nov. 30 this year 5,867,058 oz., or $121,272,068 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 25—The coal trade in the West is settling down to a quieter basis. The steam-coal demand has fallen off less than was expected, but mild weather has continued, so that the domestic demand has been rather light. Car supply is good and no mines are delayed on that account. Many mines are working on short time, however, to avoid over-stocking the markets.

The conference at Indianapolis, to consider the renewal of the Interstate agreement, did not result in any action. An adjourned meeting is to be held Jan. 20.

In the East the bituminous trade is rather dull, steam coal being in light demand. The coastwise trade is quiet.

Anthracite-coal trade is steady, but with no special activity. It is largely a weather market, and a cool spell would cause a brisk revival. Production continues large and steady.

Coal Traffic Notes

Coal tonnage, Ohio Coal Traffic Association, 10 months ended Oct. 31, short tons:

	1905.	1907.	Changes.
Hocking Valley	3,212,402	3,399,574	I. 187,172
Toledo & Ohio Cent.	1,475,093	1,506,729	I. 31,636
Baltimore & Ohio	1,570,522	1,909,401	I. 338,879
Wheeling & L. Erie	1,817,314	2,910,115	I.1,092,801
Cleve., Lorain & Wh.	1,713,578	2,443,619	I. 730,041
Zanesville & Western	953,862	1,322,452	I. 368,590
Toledo Div., Pen Co.	1,861,285	1,886,568	I. 25,283
L. Erie, Alliance & Wh.	621,623	1,017,548	I. 395,925
Marietta, Col. & Clev.	10,726	27,898	I. 17,172
Total	13,236,405	16,423,901	I.3,187,499

October total was 1,664,863 tons in 1906, and 1,842,685 this year.

Coastwise coal shipments, chief Atlantic ports, 10 months ended Oct. 31, long tons:

	Anthracite.	Bitum.	Total.	Per Ct.
New York	13,830,297	9,701,396	23,531,693	64.4
Philadelphia	1,992,560	4,250,296	6,242,856	17.1
Baltimore	208,764	3,158,265	3,367,029	9.2
Newp't News	.....	1,989,239	1,989,239	5.4
Norfolk	.....	1,412,923	1,412,923	3.9
Total	16,031,621	20,512,119	36,543,740	100.0
Total, 1906.	12,860,919	18,656,254	31,517,173	.....

New York includes all the New York harbor shipping ports.

Pennsylvania Railroad east of Pittsburg, year to Dec. 14; short tons:

	1906.	1907.	Changes.
Anthracite	4,381,885	5,427,766	I. 1,045,881
Bituminous	31,015,051	38,131,372	I. 7,116,321
Coke	12,203,565	12,816,027	I. 612,462
Total	47,600,501	56,375,165	I. 8,774,664

Total increase this year was 18.6 per cent.

Southwestern Interstate Coal Operators' Association, nine months ended Sept. 30, short tons:

	1906.	1907.	Changes.
Missouri	1,680,659	2,012,944	I. 332,285
Kansas	3,454,072	4,664,696	I. 1,210,624
Arkansas	1,127,480	1,663,941	I. 536,461
Oklahoma	1,642,033	2,121,424	I. 479,391
Total	7,904,244	10,463,005	I. 2,558,761

Total gain this year 32.4 per cent.

New York

Anthracite

Dec. 25—The hard-coal market is inclined to be dull and demand is not strong. Pea coal is more active and in better demand than any of the other sizes. Prices are quoted as follows: Broken, $4.50@4.75; egg, stove and chestnut, $5; pea, $3.25@3.50; buckwheat No. 1, $2.75@3; buckwheat No. 2 or rice, $2.15@2.25; barley, $1.75; all f.o.b. New York harbor.

Bituminous

The Atlantic seaboard soft-coal market is quiet. The best grades of coal are being shipped in fair quantities both from the mines and at tidewater. These shipments are principally on old contracts, but new business seems to be maintaining prices quite well; lower grades are feeling market conditions materially and the prices on these grades are off accordingly. The specialties are selling above $3 and good grades of Pennsylvania coal bring $2.50@2.60, with the poorer grades selling around $2.40.

Embargoes are noted at certain shipping ports which indicates considerable coal standing. Discharging points in the far East are also storing coal. Some export trade has been noticed of late and with the market in the present condition this class of business is being sought.

Trade in the far East is much quieter and shipments are principally on old contracts; here and there small orders are being placed, induced probably by the report of low prices for both coal and vessel freights. Trade along the Sound is fairly good, but the offerings of coal have almost swamped the market.

Transportation from mines to tide is slow, coal requiring ten days and more to run through. Car supply seems to be up to all requirements. Vessels in the coastwise trade are in good supply for all classes, but freights are weak. Quotations are as follows: From Philadelphia to Boston, Salem and Portland, 90c.; to Portsmouth, 95c.@$1; to Lynn and Newburyport, $1.05@1.10; to the Sound, 80c. per ton.

Birmingham

Dec. 23—The usual holiday curtailment in the coal production in Alabama is now on. There is a good demand for coal, however, and it is stated that just as soon as the turn of the year comes there will be a general resumption of operation at the mines. The explosion in the Yolande mine of the Yolande Coal and Coke Company, in Tuskaloosa county, in which 56 miners lost their lives, was the incident of the industry during the past week. The indications, without the official report out, are that it was another dust explosion. State Mine Inspector Gray is now busy on the formation of a report to be submitted to the governor.

Good prices prevail for coal and the larger consumers have not a great quantity of the product stacked up.

Chicago

Dec. 22—The coal market continues depressed under the influences of mild weather and slowly recovering business confidence. Users of both steam and domestic coals are buying for short-time supplies and lower-priced coals are being taken by many consumers who have not contract supplies. Operators and agents are guarding carefully the shipping of coal to the city, realizing that without general caution there may be a flood of consignments that will be disastrous.

Prices remain about the same as for the last two or three weeks, Illinois and Indiana coals bringing $2@2.75 for lump or egg, $1.75@2 for run-of-mine and $1.20@1.35 for screenings. Eastern coals generally are in danger of demurrage but hold close to previous quotations. Anthracite sales are light and small nut is more in demand.

Pittsburg

Dec. 23—Conditions in Pittsburg district are practically unchanged. The mines, except those shipping by river, are not being operated to more than 60 per cent. of capacity. There is an ample supply of railroad cars, but the idleness of many iron and steel mills has considerably reduced the demand. Prices remain about the same, on a basis of $1.15 for mine-run coal at mine. Slack is a drug on the market and is being sold at almost any price although it is regularly quoted at 40c. Trade is expected to continue dull until after the opening of the new year when there are indications of a resumption

at a number of mills. There is not likely to be much improvement in prices.

Connellsville Coke—Not more than one-third of the 35,000 ovens in the upper and lower Connellsville coke regions are in operation this week but the outlook is improving. Many inquiries have been received for next year and to date several fairly large contracts have been closed at good prices. For prompt shipment prices continue low, furnace coke being quoted at $2@2.25 and foundry at $2.50@2.60. Contracts for foundry coke for the first six months of 1908 are being on a basis of $2.75 a ton. The *Courier* in its summary for the week gives the production in both fields at 137,252 tons. The shipments aggregated 5922 cars, distributed as follows: To Pittsburg, 2475 cars; to points west of Connellsville, 2947 cars; to points east of Connellsville, 500 cars.

Foreign Coal Trade

German coal imports and exports, 10 months ended Oct. 31, metric tons:

Imports:	1906.	1907.	Changes.
Coal	7,510,610	11,358,689	I. 3,848,079
Brown coal	6,951,634	7,422,418	I. 470,784
Total	14,462,244	18,781,107	I. 4,318,863
Exports:			
Coal	16,314,361	16,457,143	I. 142,782
Brown coal	14,549	17,334	I. 2,785
Total	16,328,910	16,474,477	I. 145,567

Imports of coke this year, 481,632; briquets, 154,992 tons. Exports of coke, 3,159,941; briquets, 1,006,932 tons.

Coal production in Germany, 10 months ended Oct. 31, metric tons:

	1906.	1907.	Changes.
Coal	114,273,413	119,296,980	I. 5,023,567
Brown coal	46,098,425	51,106,430	I. 5,008,005
Total mined	160,371,838	170,403,410	I. 10,031,572
Coke made	16,720,631	18,139,234	I. 1,418,603
Briquets made	12,066,857	13,613,762	I. 1,546,905

Of the briquets made this year 10,713,952 tons were from brown coal, or lignite.

Coal bunkered, or supplied to steamships in foreign trade at United States ports for the 10 months ended Oct. 31 was 5,034,315 long tons. Added to the imports, previously reported, this makes 16,045,877 tons coal sold for consumption beyond the limits of the United States.

Iron Trade Review

New York, Dec. 25—Business continues quiet, with few new orders coming in. Of course there are little revivals here and there. New inquiries are reported for some basic pig, and also for some foundry iron for pipe work. Some structural work is in sight, but a good deal depends on prices and terms.

A series of important meetings is to be held in Pittsburg during the next ten days. These meetings are for the purpose of arranging prices for next year, and from the present sentiment there will be no radical changes. A revision in black and galvanized sheets seems probable, as prices have not been regular for some time, and the price of spelter, which kept up prices of galvanized, has been materially reduced. Steel bars likely will be kept at 1.60c., as a number of contracts have been taken at that figure from agricultural implement makers that do not expire until July 1, 1908. It is difficult to make a prediction as to what will be done in the matter of prices for structural material. An adjustment in prices of steel billets, sheet and tin-bars probably will be made, as the present spread of $3 is regarded as too high. If billets are kept at $28, the price of sheet-bars for the first quarter may be fixed at $30. Rail prices will be subject to the new specifications when an agreement is reached. The railmakers have taken the initiative in this matter and have fixed a price of $28 a ton for standard sections with a discard of 9 per cent. from the ingot. A sliding scale of prices has been promulgated, the price increasing 29c. a ton with every additional 1 per cent. discard, making the price for rails with a discard of 25 per cent. $32.64 a ton. The American Railway Association, which will take up this matter, is expected to hold a meeting early in January.

Baltimore

Dec. 24—Arrivals of iron ore for the week were 11,300 tons, from Cuba. Other receipts included 300 tons of manganese ore from Rotterdam.

Birmingham

Dec. 23—The receipt of some inquiry in the Birmingham district for iron to be delivered during the coming year, recently caused such encouragement. The belief that there is to be an improvement on the turn of the year is strengthened. The make in this district has been further curtailed by two furnaces just closing down and another making preparations to close this week.

Iron quotations in the Birmingham district are being held up, $15 being a published price, with rumors of sales at $14 for No. 2 foundry. The railroads are handling all iron that is being offered.

The steel make at the plants of the Tennessee company continues healthy. The company has given notice that the custom of allowing employees from 10 days to two weeks off for the holiday period will not be permitted this year.

Chicago

Dec. 23—Though the iron market continues very quiet, business is unmistakably improving. Scattering contracts for future delivery, as well as a number of sales of small lots of pig iron for quick delivery, have been made in the last week. Inquiries are increasing and covering a wider field.

Sales and contracts for iron and steel products are very light, but here also signs are encouraging.

Pig-iron prices are uncertain, but average about $14 Birmingham for No. 2 Southern ($18.35 Chicago) and $18@18.50 for No. 2 Northern. Melters are still very cautious about prospective needs and sellers are not displaying great anxiety.

Coke remains dull at $5.40@5.65 for the best Connellsville.

Philadelphia

Dec. 24—Business is at a standstill. A few large consumers predict still lower prices and are waiting for the announcement early in January of a new schedule of prices. No matter what the reduction, if any, may be, our foundry and mill people will not buy heavily. Statements of users of pig iron as to new work differ widely. Some few are assured of continued activity with the same labor force, but the greater number are not very well off for new work. There is less optimism this week among consumers. At the same time brokers and furnace representatives say there are inquiries from large and small consumers, most of whom will need iron soon. Representatives of basic iron talk with confidence of a big business. Forge sold this week in good sized lots for January delivery.

Steel Billets—There is no business to report. Prices have weakened upward of $1 within a fortnight.

Bars—Some mills have reduced the number of puddling furnaces and are making only as much iron as is called for by their order books. A few mills have accumulated quite a stock of iron.

Sheets—The stores are doing about all the business. Scarcely any orders have gone to mills. Shaded figures have been made with a view of inducing business at the mills.

Pipes and Tubes—No business has come under notice, though prices are more in favor of buyers. A further discount is anticipated.

Plates—The distant outlook is better. The mills are in need of business, however, and they will do their best to attract business their way.

Structural Material—While the business of the week has been unimportant, the structural people here believe business is in sight—enough to keep the wheels turning. Attractive quotations have been offered this week.

Scrap—A better demand is opening up. Prices are low and are drawing customers.

Pittsburg

Dec. 24—There are still some bright spots in the iron and steel industry and prospects for improvement after the opening of the new year seem more encouraging. Announcement was made today that

it will be impossible to close the Homestead and Clairton plants of the Carnegie Steel Company for the week, and they will be idle only on Christmas. The New Castle steel works closed on Saturday, but will resume on Sunday night. Two blast furnaces of the Carnegie company at New Castle were banked on Saturday, but are scheduled to start again on Wednesday night. The Youngstown Sheet and Tube Company, which closed all of its plants on Dec. 9 for an indefinite period, was forced to start again last week to take care of new business. Most of its mills are running this week and may be going next week. The Republic Iron and Steel Company also took on some new orders and operated part time last week, some of its mills still being on the active list. Some important meetings to fix prices will be held here next week.

Pig Iron—A number of active furnaces in the Pittsburg and Valley districts have been put on the idle list and more are scheduled to go out this week. It is expected that not more than half a dozen of the 19 merchant furnaces will be going on Jan. 1. Few of the steel plant furnaces are in operation, but a number likely will resume about the first of the year. There is nothing doing in pig iron, and in the absence of transactions prices are purely nominal. Large interests continue to name $19, Valley furnaces, as the minimum price for bessemer iron for prompt and first quarter delivery, but it is probable $18 can be done. No. 2 foundry iron has declined to $17.50 at furnace. Basic remains around $17, and gray forge at about $16.50 at furnace.

Steel—The market remains unchanged, large interests still holding bessemer and open-hearth billets at $28, but no sales are recorded. Plates remain at 1.70c. and merchant steel bars at 1.60c.

Sheets—Some new business is being received, and it is reported that prices are again being shaded. Regular quotations of black sheets are on the basis of 2.60c. for No. 28 gage and 3.75 for galvanized.

Ferro-manganese—The price has declined to $51, and it is reported for prompt delivery this rate could be shaded.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Dec. 25.

At all United States Ports in Nov. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1907..	$ 615,169	$63,463,036	Imp. $62,847,867
" 1906..	1,963,757	8,935,274	" 6,971,517
Year 1907..	54,211,240	98,837,722	" 44,626,482
" 1906..	44,828,263	147,962,143	" 103,133,880
Silver:			
Nov. 1907..	4,187,378	3,350,076	Exp. 837,702
" 1906..	4,561,830	3,351,981	" 1,209,849
Year 1907..	57,212,168	41,437,995	" 15,774,173
" 1906..	53,552,186	40,228,572	" 13,323,614

Exports from New York for the week ended Dec. 21 were $9000 gold and $817,182 silver. Imports for the week were $5,712,241 gold and $249,037 silver.

Specie holdings of the leading banks of the world, Dec. 21, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$181,503,100
England	$165,383,645	.....	165,383,645
France	538,787,750	$185,464,980	624,252,730
Germany	137,140,000	38,000,000	175,140,000
Spain	78,210,000	128,560,000	206,770,000
Netherlands	38,239,500	24,619,500	62,850,000
Belgium	17,610,000	8,805,000	26,415,000
Italy	193,320,000	23,869,000	217,189,000
Russia	607,125,000	26,155,000	633,280,000
Aust.-Hungary	228,795,000	58,375,000	287,170,000
Sweden	20,325,000	.....	20,325,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Dec.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
19	4.8600	53	25 1/16	23	4.8585	52¾	24½
20	4.8640	53	24 15/16	24	4.8425	52¾	24 15/16
21	4.8600	52⅞	24¼	25	.....	....	....

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Dec.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
19	13 @13¼	12⅞ @13	59½	26½	3.35 @3.45	4.10 @4.15	3.95 @4.00
20	13⅛ @13⅜	13 @13⅛	59¾	27	3.35 @3.45	4.10 @4.15	3.95 @4.00
21	13⅛ @13⅜	13 @13⅛	.....	27	3.35 @3.45	4.10 @4.15	3.95 @4.00
23	13⅜ @13½	13⅛ @13⅜	60½	27½	3.40 @3.50	4.10 @4.15	3.95 @4.00
24	13¾ @13⅞	13¼ @13⅜	60½	27	3.45 @3.55	4.10 @4.15	3.95 @4.00
25	.....	.....	.....	....	.....	.....	.....

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—The feeling during the last week has been more hopeful, and both on this account and the increasing inquiries for the metal, prices have risen, although the total volume of the transactions has been small. A considerable portion of the transactions has been apparently of a speculative character. Although the other portion has been with consumers, both European and domestic, there is not yet manifest any general tendency among the domestic consumers to enter the market. However it is encouraging that the lower prices which have of late been established have attracted attention on the part of home consumers, while buyers abroad are willing to take a much larger interest in the metal; in fact, it is surprising what large quantities Europe is still in a position to absorb in view of the tremendous export movement which has now been going on since the beginning of October. This would tend to show that the quantities held in speculative hands are not as large as was generally believed at one time, but that the bulk of the tonnage is being distributed among all the consumers in the United Kingdom and on the Continent, who are willing to hold a normal supply at the present level of prices. The tone of the market has been rather cheerful throughout the week and some of the sellers have been more reluctant in offering copper at present prices. The close is firm and higher at 13⅜@13½c. for Lake copper; 13¼@13⅜c. for electrolytic in ingots, cakes and wirebars. The average at which business in casting has been done during the week is 12⅝@12⅞c.

The standard market in London has shown a very good undertone right along and rallied from day to day, closing with only a slight re-action at £60 10s. for spot, £61 15s. for three months.

Refined and manufactured sorts we quote: English tough, £56@57; best selected, £64@65; strong sheets, £67@68.

Copper Sheets and Wire—The base price of sheets is 20c.; wire, 16¼@16½c. per lb.

Tin—The low prices have at last attracted buyers, and quite some interest was manifest in January and February deliveries. This larger demand from here created quite a **sharp advance in** London, which at one time brought quotations up to £124 for spot, £125 10s. for three months. The advance there, however, was not sustained, and the market closes steady at £120 10s. for spot, £121 15s. for three months in London, and at 27c. for spot tin here.

Lead—It would seem from developments during the week that the protracted decline has terminated. The low prices established attracted general attention, and there has been quite a heavy buying movement both by speculators and consumers, and the latter show a tendency to anticipate their requirements for future months. On the other hand, sellers are inclined to book business for near-by shipment, so as to realize on the stocks on hand, but, as can be readily understood, they are unwilling to sell very far ahead. In view of the large quantities on hand, the buying movement has so far not made a strong impression on prices, but the close is firmer at 3.45@3.55c. New York.

The London market has also taken a more cheerful view of the situation. The re-action which was reported last week has made further progress, and the close is cabled at £14 10s. for Spanish lead, £14 12s. 6d. for English lead.

Spelter—Although there has been some speculative inquiry, the market has remained rather depressed as a great deal of spelter has accumulated which is weighing heavily on the market, on account of the financial necessities of the holders. The close is barely steady at 4.10@4.15c. New York, 3.95@4c. St. Louis.

The fear of exports from this side has caused a further decline in the London market, from where the close is cabled as £19 5s. for good ordinaries, £20 for specials.

Zinc Sheets—The base price is $7 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

Antimony—There seems to be a slightly firmer tone in the market and buying has been a little more in evidence. The amount, however, has been very small. Quotations are as follows: Cookson's, 9@9½c.; Hallett's, 8¾@9c.; ordinary brands, 8@8¼c. per pound.

Platinum—The market continues uneventful and no changes are recorded. Quotations are as follows: Hard metal, $28.50; ordinary, $26; scrap, $17@18 per troy ounce.

Nickel—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities, 50@65c., same delivery.

Quicksilver—New York quotations are $45 per flask for lots of 100 flasks or over, and $46 for smaller orders. San Francisco quotations are $44.50@45.50 for domestic orders; for export nominal, at about $1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

Aluminum—It is reported that the principal producers of aluminum in Europe have decided to reduce the price to 2s. per kg., Jan. 1, 1908. The present price is 3s., equivalent to 32.66c. per pound.

Missouri Ore Market

Joplin, Mo., Dec. 21—The highest price paid for zinc was $36 per ton, the base price for 60 per cent. zinc ranging from $28 to $34 per ton, and the average price, all grades of ore, was $30.74. The highest price for lead ore was $40, with medium grades selling at $34 to $38 per ton, and an average, all grades, of $36.98 per ton.

The shipment of the week, embracing only 11 of the 28 camps of the district, was one of the lowest since the panic days from 1893 to 1896. Additional mills were closed down tonight that will reduce the output 500 tons more per week, a total approximating 1300 tons for the past two weeks, and placing the production 60 per cent. under normal conditions. One point demonstrated during the past few weeks, is that with the reduction in wages the mines operating are securing a greatly increased efficiency from the workmen, a fact that has prevented the production falling faster than would otherwise be apparent from the number of mines now idle.

Following are the shipments of zinc and lead ore from the various camps of the district for the week ending Dec. 21.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,525,090	455,530	$ 48,828
Joplin	1,696,120	146,000	29,839
Galena	478,220	80,560	8,794
Duenweg	450,820	52,360	8,181
Prosperity	287,420	148,050	7,336
Alba-Neck City	384,590	.....	6,537
Aurora	298,820	.....	4,482
Granby	375,000	22,000	3,430
Spurgeon	138,130	23,840	1,569
Wentworth	66,370	.....	1,061
Sarcoxie	62,240	.....	995
Totals	6,755,820	928,340	$121,052
51 weeks	566,524,090	83,314,960	$15,300,916

Zinc value, the week, $103,893; 51 weeks, $12,417,440
Lead value, the week, 17,159; 51 weeks, $2,883,476

Following are the shipments of zinc and lead from the various camps of the district for the week ending Dec. 14:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June	43.83	44.82	June	80.96	73.66
July	43.25	45.79	July	74.31	58.18
August	43.56	43.22	August	75.36	59.54
September	42.58	40.11	September	79.64	53.52
October	41.55	39.83	October	79.84	51.40
November	44.13	35.19	November	81.98	43.40
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., Dec. 21—Offers of $33 per ton held throughout the week as the base price for 60 per cent. zinc ore. The price offered for 80 per cent. lead was $16 @17 per thousand, but no new sales are reported at these figures.

Shipments for the week ended Dec. 21 were as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	.....	158,750	.....
Platteville	808,600	.....	.....
Cuba City	493,380	.....	.....
Hazel Green	255,000	.....	.....
Livingston	180,000	.....	.....
Highland	174,500	.....	.....
Mineral Point	86,000	.....	.....
Total	1,997,480	158,750	.....
Year to Dec. 21	98,141,787	5,047,480	462,360

Galena, Elmo, Rewey, Linden and Harker made no shipments.

Chemicals

New York, Dec. 24—There is little to report in the general situation. Collections are extremely slow. This naturally restricts business; consumers and dealers are waiting until the first of the new year before closing contcacts.

Copper Sulphate—Business in this salt is almost at a standstill, and buyers are cautious about contracting. Prices remain unchanged at $5.50 per 100 lb. for carload lots and $5.75 for smaller quantities.

Nitrate of Soda—The recent disturbances in Chile caused by strikers among the workmen and unsettled finances do not seem to have affected quotations to any extent. For spot delivery during the last week in 1907 carloads of 95 per cent. grade are held at 2.50c. per lb., while for 1908, 2.45c. is being asked. For 1909 delivery the price is 2.40c. The 96 per cent. grade sells 5c. per 100 lb. higher for all positions.

Mining Stocks

New York, Dec. 25—Notwithstanding further arrivals of gold—which have brought the present movement up to $91,000,000—money has been scarce, with rates high enough to check any considerable speculation. In the general market stocks have not held last week's position, but close lower in several cases, today having shown a specially unfavorable movement. The holiday this week also limits business, while the near approach of the end of the year, with its settlements, is an unfavorable feature. The deferring of the Anaconda dividend was pretty well discounted.

The curb market followed the lead of the exchange. Copper stocks were dull and inclined to weakness. The only exception to the rule on the curb was a considerable movement in the Goldfield stocks, which have been rather neglected recently.

Boston

Dec. 23—There is an improved tone to the copper-share market. Money conditions are tight and carrying rates almost prohibit speculative buying. After the first of the year the general belief is that money will be cheap, and that there will be an improved demand for copper. Amalgamated rose $4.75 to $47, reacting $1.25 today. Copper Range has moved up $4 to $56.50, and North Butte $3.75 to $41. There has been some good buying of Butte Coalition and the price is up $2.25 to $15.50.

The market has been spotty and generally dull. Arizona Commercial spurted $3 to $14.50; favorable news from the Black Hawk mine of this property. Utah improved $2.25 to $30.50, but is back to $28.50, ex-dividend. U. S. Coal and Oil had a bulge to $11.37½. This company shipped 80,000 tons of coal during November, and is now getting a better car allotment from the Chesapeake & Ohio Railroad. U. S. Smelting broke $3.25 to $29.50, but is up $1 from this. It is likely that the common-stock dividend will be passed next month. Balaklala made a low record at $1.75 today, there being little or no support.

Calumet & Hecla holds close to $600 per share. Mohawk made a $4 advance on very lightt trading, and Tamarack is up $7 to $69. Trinity spurted $1.75 to $15.25, but lost most of it. Isle Royale is up $1 to $17.50, and Old Dominion rose $2 to $28.50, with partial reaction. The Bigelow people have until Jan. 9 to file an appeal in the suit brought some time ago.

More activity has been displayed on the curb and at firmer prices. Boston & Ely rose to $1.25 today on active trading. Boston & Corbin has risen to $10.50, and Davis Daly has been active at $4 and better. There are about 2000 stockholders in the latter company.

STOCK QUOTATIONS

NEW YORK Dec. 23	
Name of Comp.	Clg.
Alaska Mine	....
Am.Nev.M.&P.Co.	....
Amalgamated	45¾
Anaconda	28
Balaklala	1⅞
British Col. Cop.	4
Buffalo Cobalt	....
Butte & London	....
Butte Coalition	14⅞
Butte Cop. & Zinc	....
Cobalt Contact	....
Colonial Silver	1
Cum. Ely Mining	5⅛
Davis Daly	3⅞
Dominion Cop.	1¾
El Rayo	1¾
Foster Cobalt	.63
Furnace Creek	.20
Giroux Mine	2¾
Gold Hill	1/16
Granby, New	....
Greene Gold	¾
Greene G. & S.	⅛
Greenw'r & D.Val.	.75
Guanajuato	2 1/16
Guggen. Exp.	135
Hanapah	.35
McKinley Dar.	11/16
Micmac	3⅛
Mines Co. of Am.	1⅝
Mitchell Mining	⅝
Mont.Sho. C.(New)	3¾
Nev. Utah M. & S.	2⅛
Newhouse M. & S.	....
Nipissing Mines	6⅛
Old Hundred	1
Silver Queen	⅝
Stewart	⅝
Tennessee Cop'r.	26
Union Copper	⅞
Utah Apex	2⅛
West Columbus	.11

N. Y. INDUSTRIAL	
Am. Agri. Chem.	12⅞
Am. Smelt. & Ref.	71⅛
Am. Sm. & Ref., pf.	90
Bethlehem Steel	....
Colo. Fuel & Iron	....
Federal M.& S., pf.	61
Inter. Salt	10
National Lead	39¾
National Lead, pf.	87
Pittsburg Coal	....
Republic I. & S.	....
Republic I.& S.,pf.	....
Sloss-Sheffield	36⅛
Standard Oil	435
Tenn. C. & I.	....
U. S. Red. & Ref.	....
U. S. Steel	25⅜
U. S. Steel, pf.	87⅜
Va. Car. Chem.	....
Va. I. Coal & Coke	40

ST. LOUIS Dec. 21		
N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.03	.02
Center Cr'k	2.25	1.50
Cent. C. & C.	60.00	58.00
C.C. & C. pd.	75.00	73.00
Cent. Oil	100.00	90.00
Columbia	4.00	2.00
Con. Coal	25.00	23.00
Doe Run	120.00	110.00
Gra. Bimet.	.25	.20
St. Joe	12.00	11.00

BOSTON Dec. 23	
Name of Comp.	Clg.
Adventure	2
Allouez	25
Am. Zinc	....
Arcadian	4½
Atlantic	8½
Bingham	4¾
Boston Con.	10
Calumet & Ariz*	96
Calumet & Hecla*	599
Centennial	23½
Con. Mercur	.27
Copper Range	55½
Daly-West	8⅜
Franklin	7½
Greene-Can	5⅞
Isle Royal	17¾
La Salle	10¼
Mass.	....
Michigan	8½
Mohawk	45
Mont.C.&C.(new)	....
Nevada	7⅞
North Butte	40½
Old Colony	....
Old Dominion	28
Osceola	....
Parrot	9½
Phoenix	....
Quincy*	78
Rhode Island	2½
Santa Fe	2
Shannon	9½
Tamarack	....
Trinity	14¾
United Cop., com.	7⅝
U. S. Oil	11
U. S. Smg. & Ref.	30¼
U.S.Sm.& Re.,pd.	35½
Utah Copper*	28½
Victoria	4¾
Washington	....
Winona	....
Wolverine	113
Wyandotte	.65

*Ex. Div. †Ex. Rights.

BOSTON CURB	
	Clg.
Ahmeek	48
Ariz. Com	....
Black Mt.	4⅛
East Butte	....
Hancock Con.	....
Keweenaw	....
Majestic	1
Raven	.87
Shawmut	.32
Superior	15¼
Superior & Pitts.	9
Troy Man	.69

LONDON Dec. 24			
Name of Com.	Clg.		
	£1	0s	0d
Dolores			
Stratton'sInd.	0	3	3
Camp Bird	0	13	10½
Esperanza	1	9	6
Tomboy	1	10	0
El Oro	1	1	3
Oroville	0	13	9
Somera	...		.
Utah Apex	...		.
Ariz.Cop.,pfd.	...		.
Ariz.Cop.,def.	...		.

Cabled through Wm. P. Bonbright,& Co., N.Y.

NEVADA STOCKS. Dec. 24.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
TONOPAH STOCKS		Golden Sceptre	...
Belmont	.85	Homestake King.	.75
Extension	1.37½	Montgomery Mt.	.05
Golden Anchor	.03	Mont. Shoshone C.	4.62½
Jim Butler	.40	Original Bullfrog.	.03
MacNamara	.18	Tramp Cons	.16⅛
Midway	.50	MANHAT'N STOCKS	
Montana	1.75	Manhattan Cons.	.24
North Star	.10	Manhat'n Dexter.	.09
Tonopah & Cal.	...	Jumping Jack	.05
Tono'h Mine of N.	5.37½	Stray Dog	.10
West End Con	.33	Indian Camp	.05
GOLDFI'D STOCKS		GREENW'R STOCKS	
Adams	.05	Furnace Creek	...
Atlanta	.29	Greenwater &D.V.	...
Blue Bell	.07	Green'rCop.M.&S.	...
Blue Bull	.17	United Greenwa'r	...
Booth	.17	MISCELLANEOUS	
Columbia Mt	.17	Golden Boulder	.10
Comb. Frac	.76	Hayseed	.30
Cracker Jack	.08	Lee Gold Grotto	.10
Dia'dfield B. B. C.	.18	Nevada Hills	3.00
Goldfield Belmont	.14	Nevada Smelting.	1.25
Goldfield Con.	4.50	Pittsburgh S. Pk.	1.25
Goldfield Daisy	.98	Round Mt. Sphinx	.25
Goldfield Mining.	...		
Great Bend	.26		
Jumbo Extension	.57		
Jumbo Mining	...		
Katherine	.06		
Kendall	.10		
Laguna	...		
Lone Star	.10		
Lou Dillon	...		
May Queen	.05		
Mohawk	...		
Oro	.10		
Red Hill	.30		
Red Top	...		
Roanoke	.07		
Sandstorm	.20		
Silver Pick	.27		
St. Ives	.42		
Triangle	.18		
BULLFROG STOCKS			
Amethyst	...		
Bullfrog Daisy	...		
Bullfrog Mining	.04		
Bullfrog Nat. B.	.10		
Gibraltar	.10		
Gold Bar	.40		

COLO. SPRINGS Dec. 14	
Name of Comp.	Clg.
Acacia	....
Black Bell	....
C. C. Con	....
Dante	5½
Doctor Jack Pot	6
Elkton	46½
El Paso	29
Findlay	38
Gold Dollar	6
Gold Sovereign	4
Isabella	23¾
Index	....
Jennie Sample	....
Jerry Johnson	....
Mary McKinney	38
Pharmacist	....
Portland	1.00
Un. Gold Mines	5
Vindicator	77
Work	14½

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Cement	Jan. 23	$0.30	$60,000
Am. Sm'g & Ref. Co., com.	Jan. 15	2.00	1,000,000
Am. Sm'g & Ref. Co., pfd.	Jan. 2	1.75	875,000
Buffalo Mines, Ltd	Jan. 1	0.03	27,000
Cent. C. & C., com	Jan. 15	1.50	76,875
Cent. C. & C., pfd.	Jan. 15	1.25	23,438
Doe Run	Jan. 15	0.50	29,531
Dominion Coal	Jan. 1	1.00	150,000
Empire Steel, pfd.	Jan. 1	3.00	75,000
Gen. Chemical, pfd.	Jan. 2	1.50	150,000
Inter. Nickel, pfd.	Feb. 1	1.50	131,123
Kerr Lake	Jan. 31	0.15	90,000
Mammoth	Dec. 20	0.05	20,000
Maryland Coal	Jan. 15	4.00	75,400
McKinley Darragh	Jan. 15	0.04	80,000
Mines Co. of Am.	Dec. 26	0.02	40,000
Monon Con. C. & C., pfd.	Jan. 25	3.50	350,000
Montezuma M. & S.	Jan. 10	0.04	40,000
New Idria	Jan. 1	0.02	20,000
Nipissing	Jan. 21	0.15	180,000
Pocahontas Con., pfd.	Jan. 1	3.00	84,000
Sloss. Sheff., pfd.	Jan. 2	1.75	117,250
St. Joseph	Dec. 20	0.15	150,000
Utah Con	Jan. 15	0.50	450,000
Va. Car. Chem., pfd.	Jan. 15	2.00	360,000

Assessments

Company.	Delinq.	Sale.	Amt.
Crown Point, Nev.	Nov. 26	Dec. 19	$0.10
Del Monte, Cal.	Nov. 20	Dec. 11	10.00
Emerald, Utah	Dec. 14	Jan. 11	0.01
Etna-King, Cal.	Dec. 14	Jan. 6	0.03
Hale & Norcross, N.	Dec. 6	Dec. 23	0.10
New Stockton, Utah	Dec. 23	Jan. 20	0.02½
Pacific Tin M. Al'ka	Nov. 30	Dec. 20	0.02
Pittsburg C., Utah.	Dec. 2	Dec. 23	0.01
Posey Canyon, Utah	Dec. 6	Dec. 23	0.01
Progressive, Utah.	Dec. 16	Jan. 6	0.01
ProvidentOilMg.,Ca.	Dec. 7	Dec. 27	0.01½
Rescue, Nev.	Dec. 10	Jan. 3	0.02
Savage, Nev.	Jan. 8	Jan. 30	0.10
Scottish Chief, Utah	Dec. 9	Dec. 28	0.01
Sierra Nevada, Nev.	Dec. 30	Jan. 20	0.10
Silver Queen, Utah.	Dec. 7	Dec. 24	0.01½
Surprise, Ida.	Dec. 11	Jan. 5	0.01½
Ultimo, Cal.	Dec. 2	Dec. 23	0.05
Wabash, Utah	Nov. 30	Dec. 23	0.03
West End, Utah	Nov. 3	Dec. 31	0.01½
Yellow Jacket, Nev.	Dec. 18	Jan. 23	0.25

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	65.462	29.984	30.253
May	66.976	65.981	30.968	30.471
June	65.394	67.090	30.185	30.893
July	65.105	68.144	30.113	31.366
August	65.949	68.745	30.529	31.637
September	67.927	67.792	31.483	31.313
October	69.523	62.435	32.148	28.863
November	70.813	58.677	32.671	27.154
December	69.050	.....	32.003	.....
Year	66.791	.....	30.868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475	24.048	18.724	25.072	84.867	102.375
June	18.442	22.665	18.719	24.140	83.994	97.272
July	18.190	21.130	18.585	21.923	81.167	95.016
August	18.380	18.356	18.706	19.255	83.864	79.679
September	19.033	15.565	19.328	16.047	87.831	68.375
October	21.203	13.169	21.722	13.551	97.269	60.717
November	21.833	13.391	22.398	13.870	100.270	61.226
December	22.885	.....	23.350	.....	105.226	.....
Year	19.278	.....	19.616	.....	87.282	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	41.091
February	36.403	42.102	August	40.606	37.667
March	36.662	41.313	September	40.516	36.689
April	38.900	40.938	October	42.852	32.620
May	43.313	43.149	November	42.906	30.833
June	39.260	42.120	December	42.750	.....
			Av. year	39.819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685	6.000	16.725	19.688
June	5.750	5.760	16.813	20.188
July	5.750	5.288	16.525	20.350
August	5.750	5.250	17.109	19.063
September	5.750	4.813	18.266	19.775
October	5.750	4.750	19.350	18.531
November	5.750	4.376	19.281	17.281
December	5.900	.....	19.609	.....
Year	5.657	.....	17.370	.....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

MONTH.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.087	6.685	5.931	6.535	25.781	25.900
May	5.997	6.441	5.846	6.291	27.000	25.563
June	6.096	6.419	5.948	6.269	27.728	25.469
July	6.006	6.072	5.856	5.922	26.800	23.850
August	6.027	5.701	5.878	5.551	26.938	21.969
September	6.216	5.236	6.056	5.086	27.563	21.050
October	6.222	5.430	6.070	5.280	28.075	21.781
November	6.375	4.925	6.225	4.775	27.781	21.438
December	6.593	.....	6.443	.....	27.938	.....
Year	6.198	.....	6.048	.....	27.020	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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THE ENGINEERING AND MINING JOURNAL

Vol. 84. 505 Pearl Street, New York. No. 26.

Contents, 1220. Index to Advertisers, 40. Buyers' Directory, 42. Professional Directory 61.

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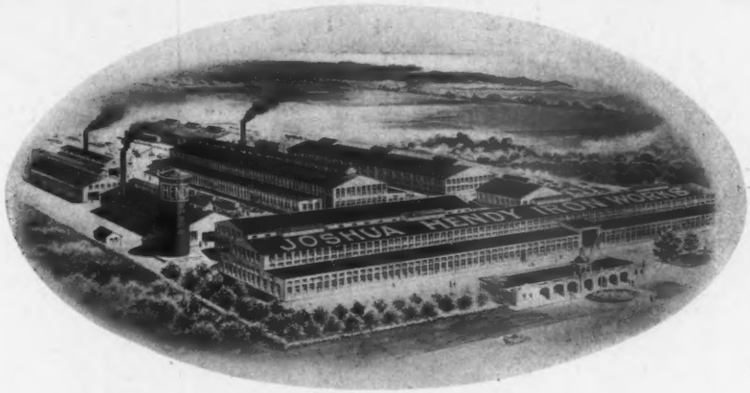
Established 1856.



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Steam, Compressed Air, Hydraulic and Electrically driven Winding Engines. Air Compressors (belt driven steam or hydraulic actuated). Air and Steam Rock Drills. Mine Cages, Water and Ore Buckets, Ore Bin Gates, Improved Tunnel and Tram Cars, etc. Ventilating Fans.

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Stephens-Adamson Mfg. Co.

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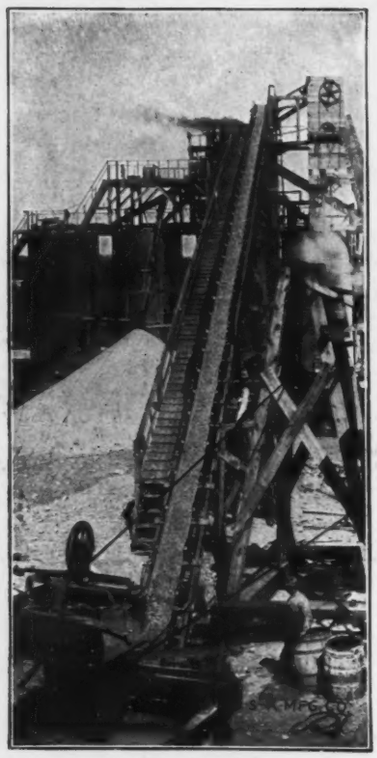
Cement,
Clay,
Sand,
Gravel.



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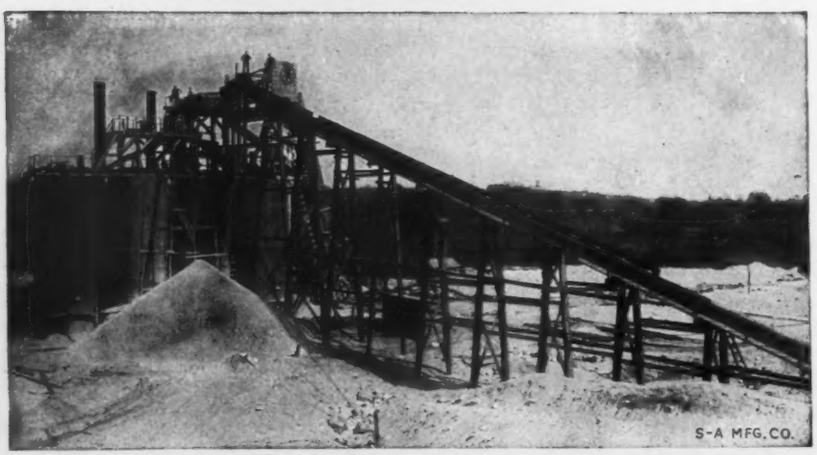

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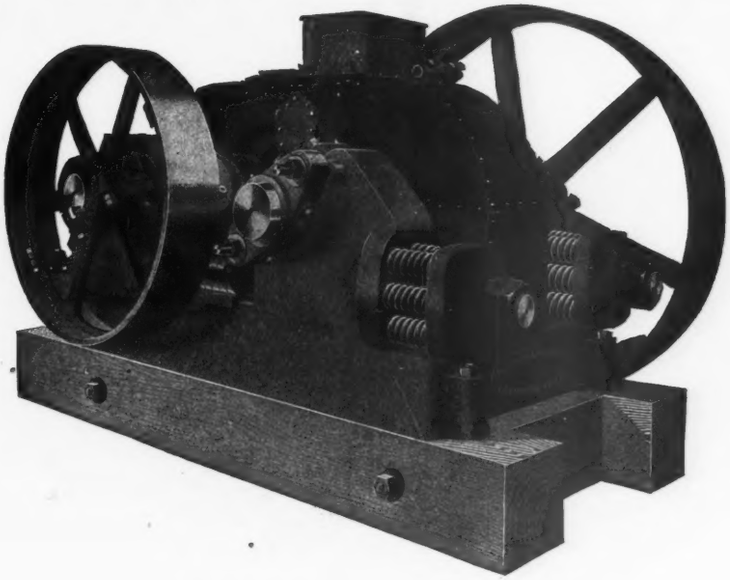

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24" x 8"	30" x 10"	36" x 12"
24" x 10"	30" x 12"	36" x 14"
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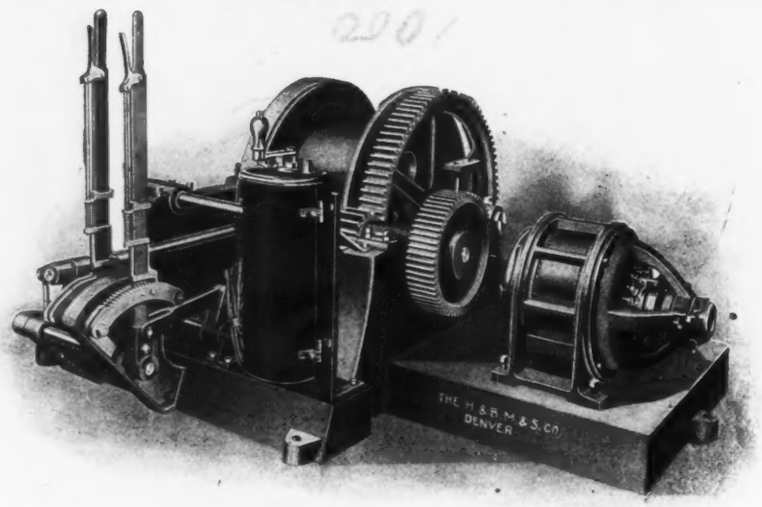
DENVER, COLO.

STEAM ELECTRICAL AND HYDRAULIC ENGINEERING ~ MINE AND SMELTER SUPPLIES.

ELECTRIC HOISTS

Sizes Of Single And Double Drum

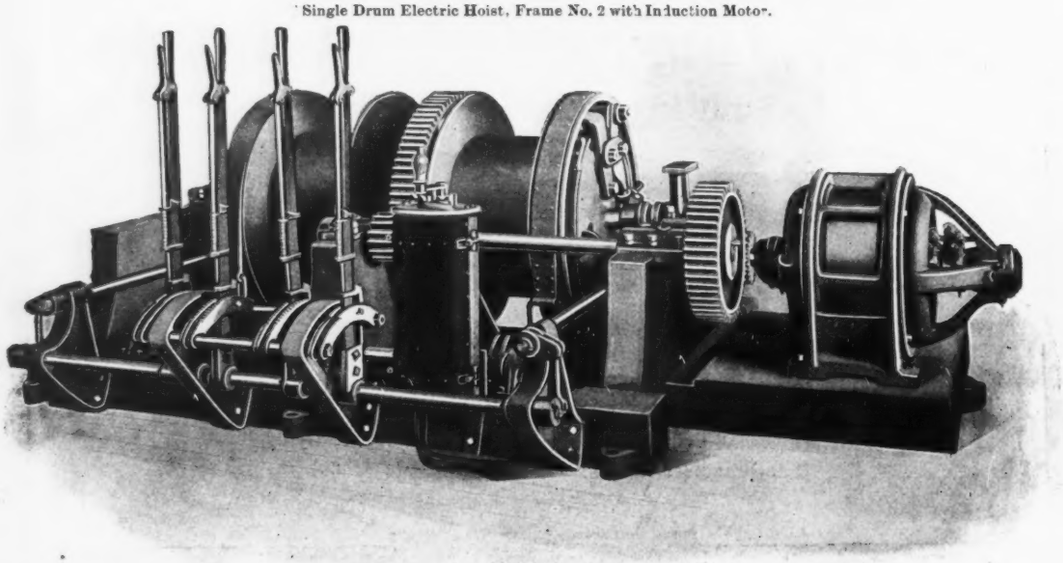
7½ H. P.
11 H. P.
15 H. P.
18 H. P.
22 H. P
24 H. P.
30 H. P.
37 H. P.



Sizes Of Single And Double Drum

52 H. P.
75 H. P.
82 H. P.
112 H. P.
125 H. P.
150 H. P.
200 H. P.

Single Drum Electric Hoist, Frame No. 2 with Induction Motor.



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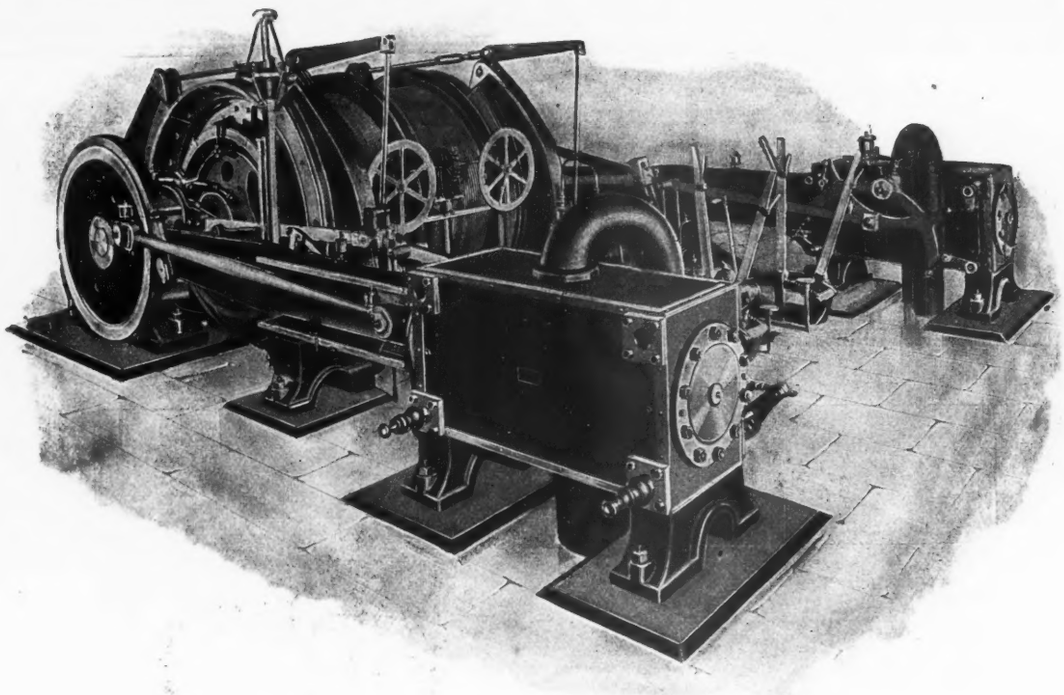

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DIRECT-ACTING HOISTS with NON-DETACHING VALVE GEAR

SOME ADVANTAGES

Increased simplicity of mechanism. Positive operation of valve gear under all conditions with no limitations as to speed. Fewer wearing parts. Fewer adjustments required. Quiet operation.

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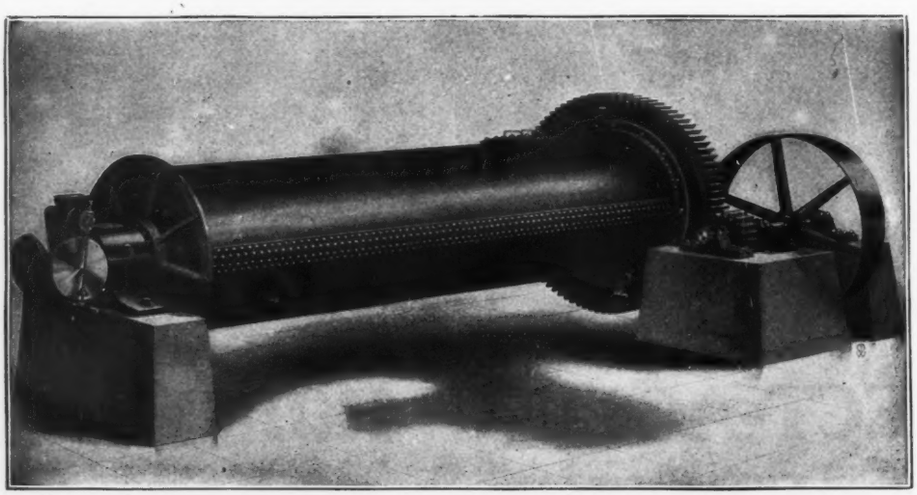
for either wet or dry grinding.

Experience has demonstrated a saving of from 10 to 50% when used as an auxiliary to the stamp batteries.



Our Tube Mills are provided with peripheral or center discharge for wet grinding and dustless feed and discharge for dry grinding, and may be driven from either end by spur or bevel gears, as desired.

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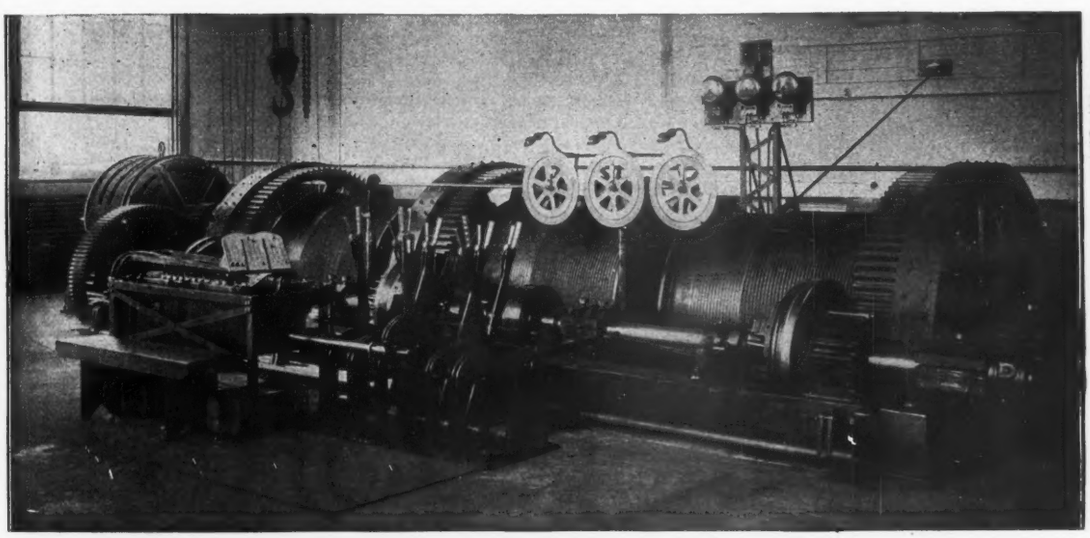

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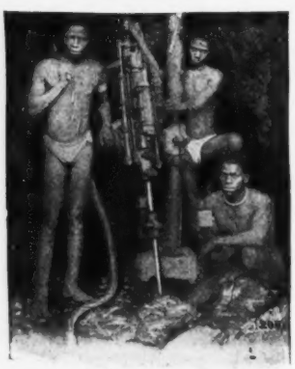
In a Michigan Copper Mine. About 90% of the Rock Drills used in the Michigan Copper District are Ingersoll-Rand Drills.

In Russia.

A rock drill represents an investment of capital and its value is to be measured by its earning capacity—the interest returned on the investment. The better built a drill is, the more satisfactory is its operation, the higher its economy, the longer its useful life and the greater the net returns on its work. The drill cheapest in first cost is, in the long run, the most expensive when measured by profit-earning capacity. The best drill is the one which pays the largest interest on the investment it represents.



In a South Africa mine. Over 80% of the Rock Drills used in South Africa are Ingersoll-Rand Drills.

In an East River Tunnel, New York. On the subaqueous tunnel work in New York City over 350 Ingersoll-Rand Rock Drills are used.

On the Tidewater Railway Construction through Virginia and West Virginia. 363 Ingersoll-Rand Rock Drills are used on this work and 90 of all other makes.

INGERSOLL-RAND CO.

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CHICAGO PHILADELPHIA PITTSBURG EL PASO
SEATTLE VANCOUVER MONTREAL TORONTO ROSSLAND HALIFAX
MEXICO CITY TORREON, MEX. LIMA LA PAZ IQUIQUE VALPARAISO SHANGHAI

E111

In England. Submarine drilling by barge method.

In a Cripple Creek mine. Over 75% of the Rock Drills used in the Cripple Creek District are Ingersoll-Rand Drills.

Submarine drills at Christiana, Norway.

STANDARD OF THE WORLD

Ingersoll-Rand Rock Drills are maximum dividend-earners. Design, material and workmanship represent that superiority which comes only with 37 years of rock drill building, covering almost 90,000 drills which have gone into every country in the world where rock is drilled. The several types afford a drill which is the best, whatever the drilling conditions, and which can always be relied upon to return the largest profits on the investment.

In China; on the construction of the Chinese Eastern Railway.

In Wales; on harbor excavation work.

"LITTLE GIANT" Catalog 46.

"SERGEANT" Catalog 45B

In West Australia; working in the Golden Horseshoe Mine.

On the Panama Canal. 183 Ingersoll-Rand Rock Drills are used on the Canal.

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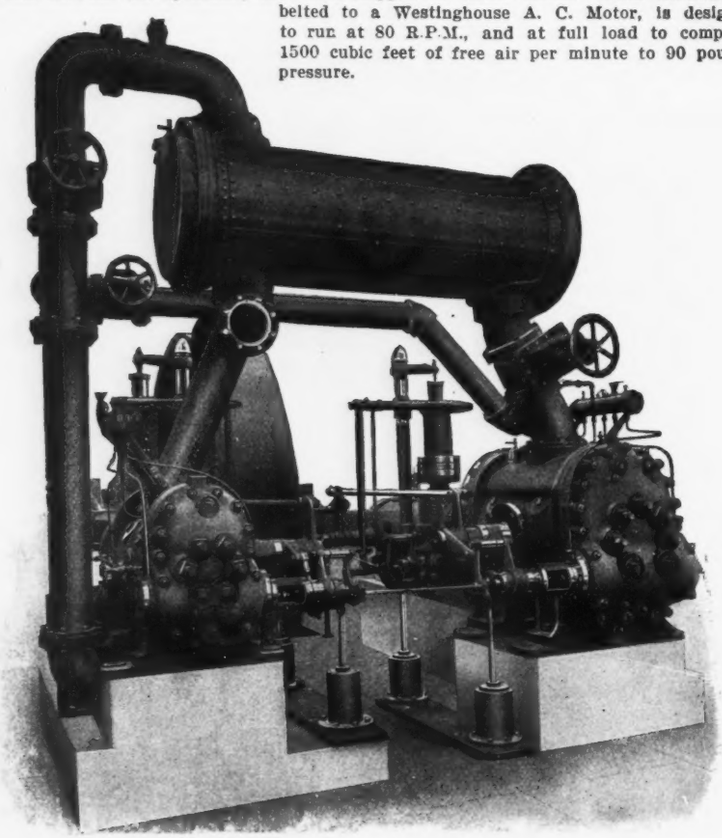
E111

NORDBERG

Goldfield Consolidated Mines Co.,

GOLDFIELD, NEVADA.

Two Variable Capacity, Two-Stage Nordberg Compressors, having vertical intercoolers above and between the cylinders, have been shipped to these mines. Each machine is belted to a Westinghouse A. C. Motor, is designed to run at 80 R.P.M., and at full load to compress 1500 cubic feet of free air per minute to 90 pounds pressure.



HOISTS, COMPRESSORS and BLOWING ENGINES

Variable Capacity Compressors are "Nordberg" in design and construction; run at a constant speed; deliver air at a pre-determined fixed pressure; automatically vary the quantity of air delivered from none, or any intermediate, to full capacity, and, except for the extremely small friction load, consume power only in proportion to the amount of air delivered.

Cost of operation and maintenance the minimum. Air and mechanical efficiency the maximum.

Can be built for any drive, and for speeds up to 160 R.P.M.

PUMPS, POPPET VALVE and CORLISS ENGINES

NORDBERG MANUFACTURING COMPANY,

Milwaukee Wisconsin, U.S.A.

DESIGNERS AND BUILDERS OF HIGH GRADE MACHINERY

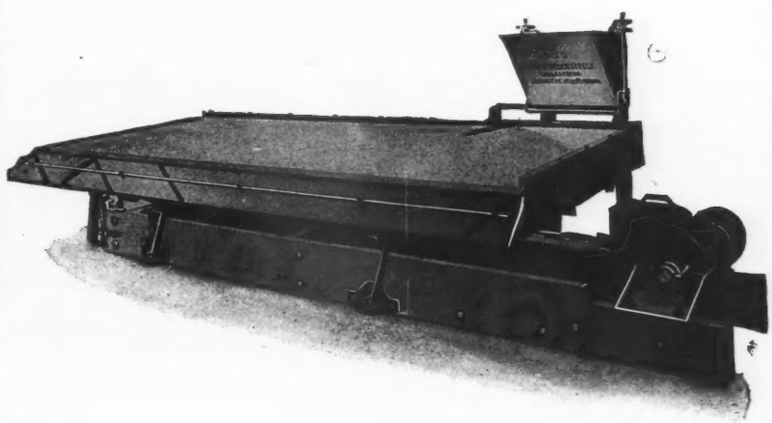
SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S

S. S. & S.

Dry Concentrating Table

The Table That Does The Most Perfect Work.

This table should not be classed with other dry concentrating machinery. It is a radical departure from all previous attempts at dry concentration. There is no blowing of the ore about, no dust when the table is in operation and air is merely used as a floating medium for the ore. It differs from all previous attempts at dry concentration in that it is the first thoroughly practical dry concentrator. It resembles in appearance the ordinary well known types of wet concentrating tables, the separation being effected by the reciprocating movement of the table, air, under slight pressure, merely being used to cushion the ore and gives such perfect mobility as to permit of the most exact separations. Clean, dry air is obtainable everywhere, is easily and cheaply handled and controlled, and as a suspending medium for ore separation is far superior to water in every respect.



The S. S. & S. Table.

Will treat ore ranging in size from 18 mesh to 173 mesh, and finer. An ordinary suction-blower fan is used. The air enters the table from below into an air chamber below the deck and passes through the pervious top, where it instantly expands, causing a film of air, under pressure, on the upper side of the pervious top. This air film supports and stratifies the material being treated vertically into strata, the heaviest on the bottom, then the next heaviest, etc., and the reciprocating motion of the table causes these strata to travel and separate from each other into zones of separated material. The head motion and table support used impart not only a variable stroke, but also a slight rising and falling motion to the deck, which causes the material to travel rapidly and also takes full advantage of the frictional values of the material being treated, an important factor that does not enter into wet table concentration.

A common domestic cloth top is used, and it is a singular fact that not a single one of these cloths have been changed on account of wear. This is due to the protection afforded by the air film, one cloth having been used for over a year on a slime table. No riffles are used on our tables, the peculiar construction of the deck together with the peculiar stroke of the table and supporting air film causes the separation.

Only a sufficient amount of air is used to float the material consequently there is no dust, while the air being constantly supplied from below keeps the deck load in a perfectly fluid condition making separation by the head motion and table adjustments both rapid and thorough.

Some Advantages of the S. S. & S.

It makes a higher grade concentrate with less loss in tails than any wet table.

Has about three times the capacity of best types of wet tables.

Will separate minerals having less than one-half of one per cent. difference in specific gravity.

Will treat slimes down to and through 173 mesh.

First cost less than wet tables when capacity is considered.

Requires less mill room per ton of ore treated.

No pumping of water.

No freezing in winter.

Can be installed anywhere regardless of water supply.

Will make separations impossible on any wet table.

No wash water on the deck to disturb strata after being formed.

Long life.

Size of deck 5 feet x 12 feet. Weight 2500 lbs. Capacity from 1000 lbs. per hour on slimes, to 2 tons per hour on 20 mesh.

1-4 to 1-2 H.P. required for tables and from 1-2 H.P. on slimes to 3 H.P. on 20 mesh material for fans.

We also manufacture the following ore separating machinery.

The S. S. & S. Dielectric Separator.

For separating iron from zinc concentrates or middlings, and fluorspar from zinc.

S. S. &. S. Dry Jig.

For dry placer and the coarse mesh material on any single value ore. In placer work it will make a clean concentrate of the black sand and gold and has a capacity of about three tons per hour on 8 mesh material.

S. S. & S. Magnetic Separator.

For general magnetic ore separation.

Electro-Static Generators, Ore Sizers, Roasters, Dryers, etc.

We are prepared to estimate on complete equipments for dry ore concentration for any kind of ore. Write us your concentrating troubles.

Our Testing Plant.

We have a testing plant with complete equipment, including all S. S. & S. Dry Concentrating and Separating Machinery, which we are operating for the benefit of our customers, and will be pleased to receive sample lots of ore of from one to two tons. A charge will be made for these tests of $75.00 per sample which will be credited on order for tables, and for the assaying necessary in connection with same. All ore must be plainly marked with shipper's name and prepaid.

TABLE BULLETIN FOR THE ASKING.

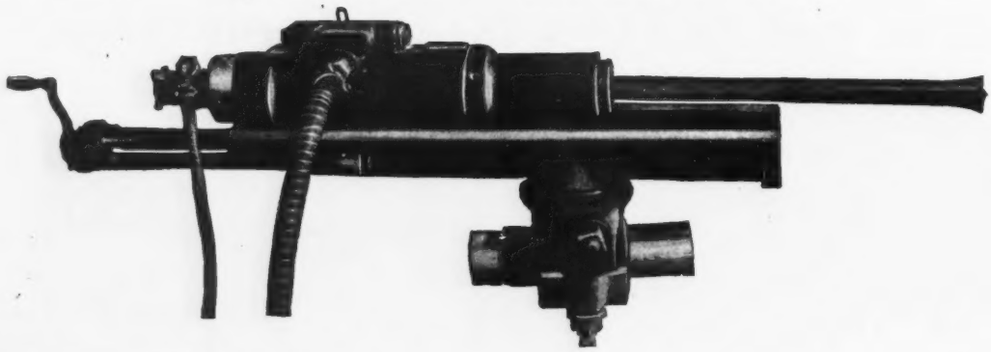
Sutton, Steele & Steele, Inc.,

194 N. Jefferson Street, Dallas, Texas.

SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S

MORE ABOUT THE Model 6 Water Leyner Drill

By THOSE WHO KNOW.



Extract from letter---Nov. 9, '07

"We think your Model 6 Drill is the ONLY drill that would do satisfactory work in such ground as we are working."

From Another---Nov. 12, '07

"We are greatly pleased with the work of the Model 6 Leyner Drills. They are doing fine work in all the different kinds of ground in which we are working, which at different times has included SOFT TALC, PORPHYRY and the HARDEST KIND of BLUE GNEISS."

Why don't YOU join the Leyner Battalion? You CAN'T save money any faster.

Your neighbor, who is using Model 6 Water Leyners, is getting a *great deal more for every dollar* he spends on his rock work than *you* are with your old fashioned piston drills. They were the *best* forty years ago—because there were no *hammer* drills.

Drill More Ground! Break it with Less Powder! Reduce Your Power Expense! Lay the Dust and Preserve the Health of Your Men!

GET THE MAXIMUM RETURNS FROM YOUR PAY ROLL!

LET US HEAR FROM YOU.

The J. Geo. Leyner Engineering Works Co.,

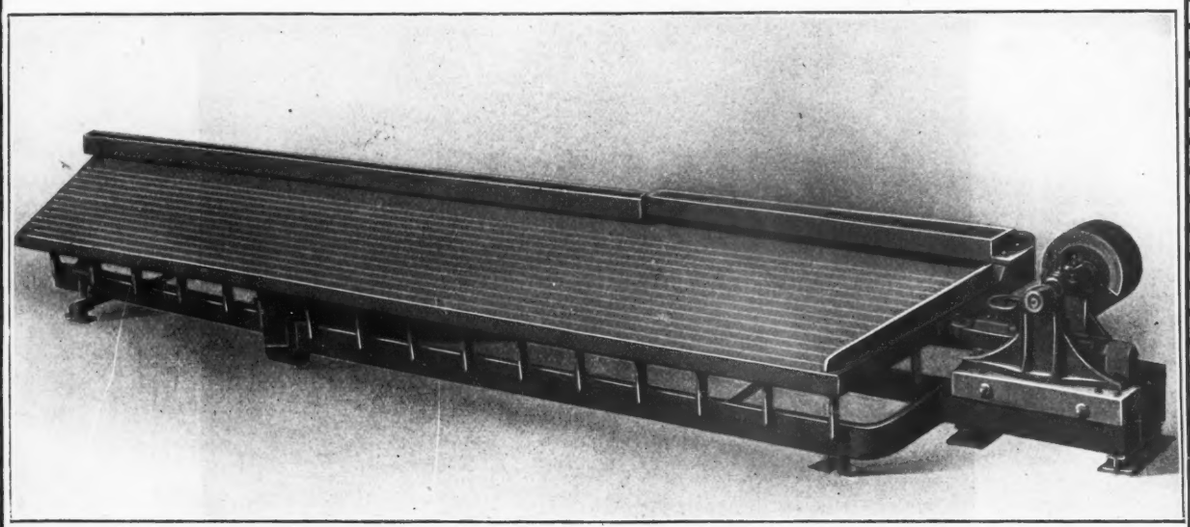
General Offices and Works, LITTLETON, COLO., U. S. A.

Manufacturers of Water Leyner Drills, Air Feed and Pneumatic Hand Drills, Drill Sharpeners, Air Compressors, Steam and Electric Hoists, Cars, Cages, Skips, Etc.

Branches or Agencies in Principal Mining Centers of the World.

DON'T BUY

an out-of-date Concentrator on a worn-out reputation.



TRAYLOR CONCENTRATING TABLE

Many a purchaser will later realize had he purchased a

TRAYLOR CONCENTRATOR

when it was first brought to his attention, it would have paid for itself from the additional values saved—**and more, too**—which would have been equivalent to getting it for nothing.

The market is full of all sorts of **"concentrators"** at all sorts of prices. Old style concentrators, once popular—**perhaps**—but now old fashioned and antiquated, have been revived and given a new name. But the concentrator, of all others, that has made its way against the severest competition and come out at the top without a peer, is the Traylor. *Write for Catalog T.*

Are you going to buy a plant? We have some very interesting things to say in regard to the building of a mining or metallurgical plant, no matter what your local conditions may be. Would it not be wise to write us and find out what we have to say on this subject before you award a contract?

Centripact Screens, Cat. No. 1—29.
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MANUFACTURERS OF MINING MACHINERY, ALL KINDS, ALL PURPOSES.

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Agents: Newbury Machinery Co., Century Bldg., Denver, Colo.

The Murphy Drill

Is A Leader And A Laster

Leads—because it is more durable, more speedy—more convenient.

Lasts—because durably made by men who know—*from practical experience*—what is demanded from the worker's standpoint and the owner's as well.

Let's go *into the subject together.*

C. T. Carnahan Manufacturing Co.,

Denver, Colo., U. S. A.

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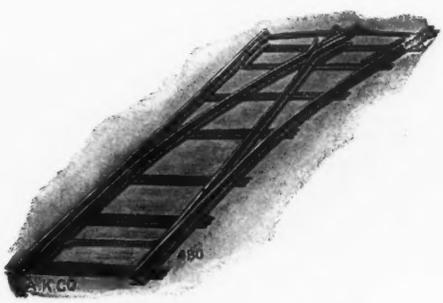
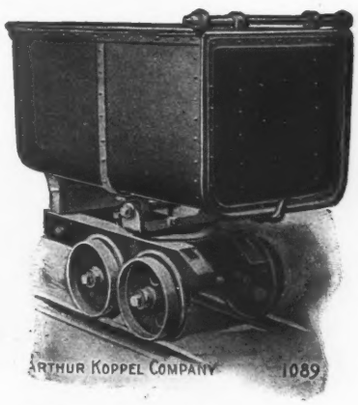
REDUCE LABOR COST.

For all grading or excavating operations, for use about the quarry or in the mine, the Koppel System of portable railways reduces the cost from 35 to 50 per cent. Enables a contractor to make money at less than the work actually costs his competitor using the old system of wheelbarrows and scrapers.

The Koppel System is economical, efficient and adapted to all work in which the transportation of materials or products is an essential item.



Portable Track and Switches.



Steel Mine Cars of all descriptions.

Write us about your own work.
Let us tell you how the KOPPEL SYSTEM CAN SAVE YOU MONEY.

Write for illustrated booklet No. 38.

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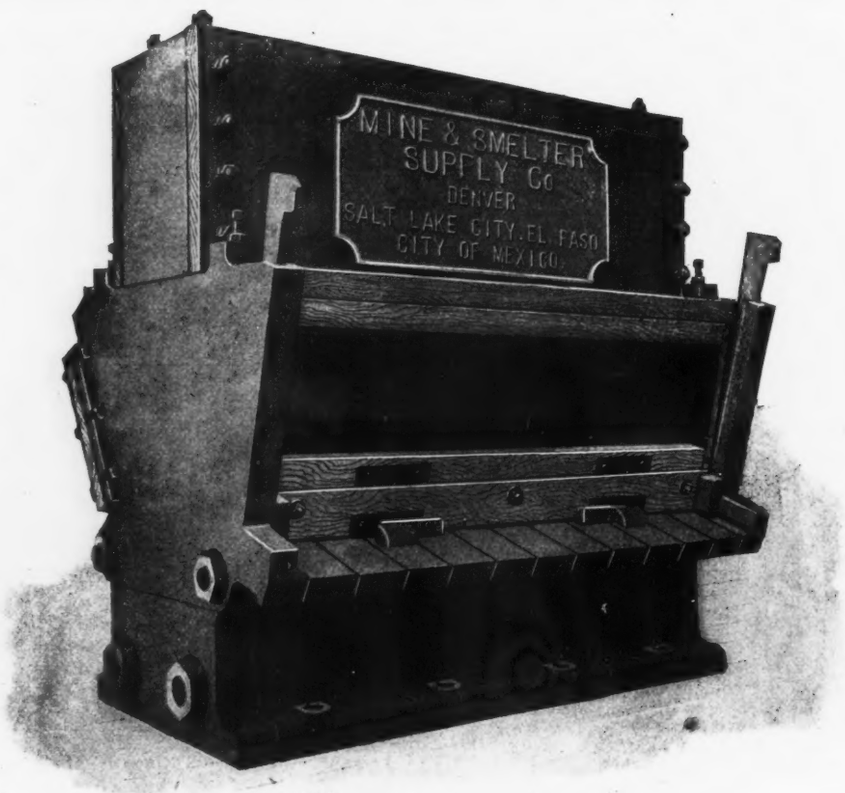
THE LARGEST MINING MACHINERY HOUSE IN THE WORLD

THE MINE & SMELTER SUPPLY CO.

SOLE OWNERS AND MANUFACTURERS OF THE WILFLEY CONCENTRATING AND SLIME TABLE

SECTIONAL MACHINERY



MORTAR SECTIONALIZED TO 300 LBS. LIMIT.

WE MAKE A SPECIALTY OF MANUFACTURING "SECTIONAL MACHINERY" FOR TRANSPORTATION ON PACK ANIMALS AND ARE PREPARED TO FURNISH COMPLETE STAMP MILLS, CONCENTRATING PLANTS AND OTHER MACHINERY BUILT IN THIS MANNER.

ESTIMATES AND SPECIFICATIONS FURNISHED UPON REQUEST.

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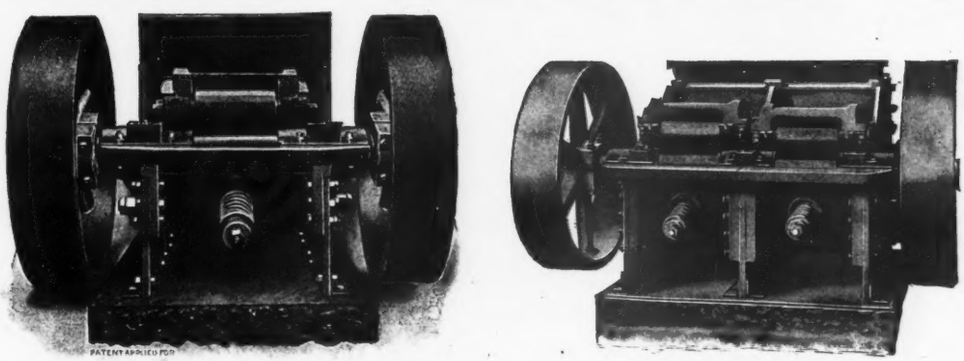
STURTEVANT

As the Only Manufacturers of the Only Crushers able to crush large, hard ore to ½ *inch* without screens, we announce:

ROLL JAW CRUSHER

PRICES REDUCED 1/2



Patented.

WITH NO SACRIFICE IN QUALITY.

Unbreakable Plate Steel Construction and increased manufacturing facilities has *halved the weight and halved the cost* of these crushers and made an infinitely better machine. Plate Steel has four times the strength of cast iron and twice that of cast steel, is flawless and absolutely reliable. By rabbitting the unbreakable side plates to the massive front anvil casting and with ample support from the special rear beam casting, the bolts only hold the parts together taking no strain—Thus perfect rigidity is attained. Send for Catalog and new prices.

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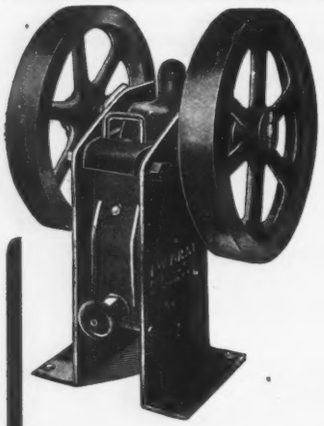
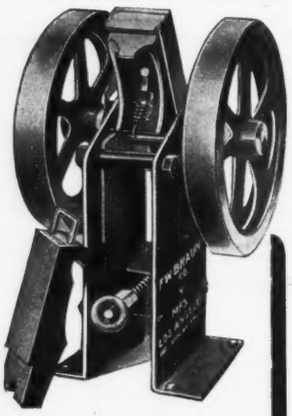
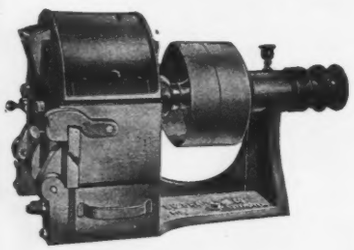


BRAUN'S
LABOR SAVERS
FOR THE
Assayer and Metallurgist



BRAUN'S CHIPMUNK CRUSHER

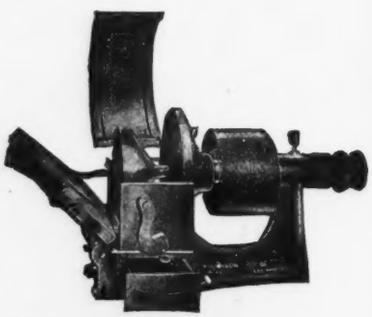
is the strongest Laboratory Crusher made. STEEL FRAMES and MALLEABLE IRON JAWS and FITTINGS are used in their construction. Two sizes—300 and 500 Pounds per hour. THE CHIPMUNK CRUSHER AND DISC PULVERIZER MAKE A COMPLETE OUTFIT.



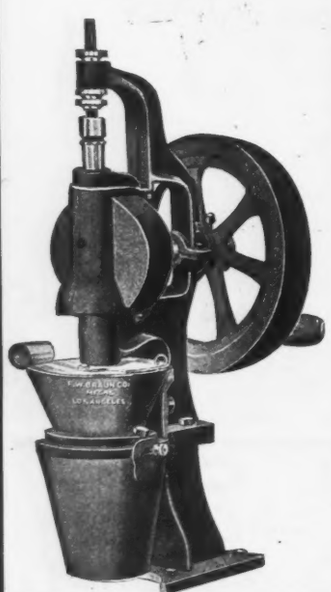
BRAUN'S DISC PULVERIZER

will take the product of the Chipmunk Crusher and reduce it to 100 mesh with one grinding.

Braun's Sample Grinder



is a new hand-power Laboratory Grinder. It is ball-bearing, light-running and easily cleaned. IT IS GUARANTEED to pulverize any material that can successfully be reduced on a bucking-board and to do away with the drudgery of the latter. It produces a uniform product with one grinding.



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We manufacture the largest line of Laboratory Labor-Saving Appliances and carry the most complete stock of Assayers' Materials of any house in the world.

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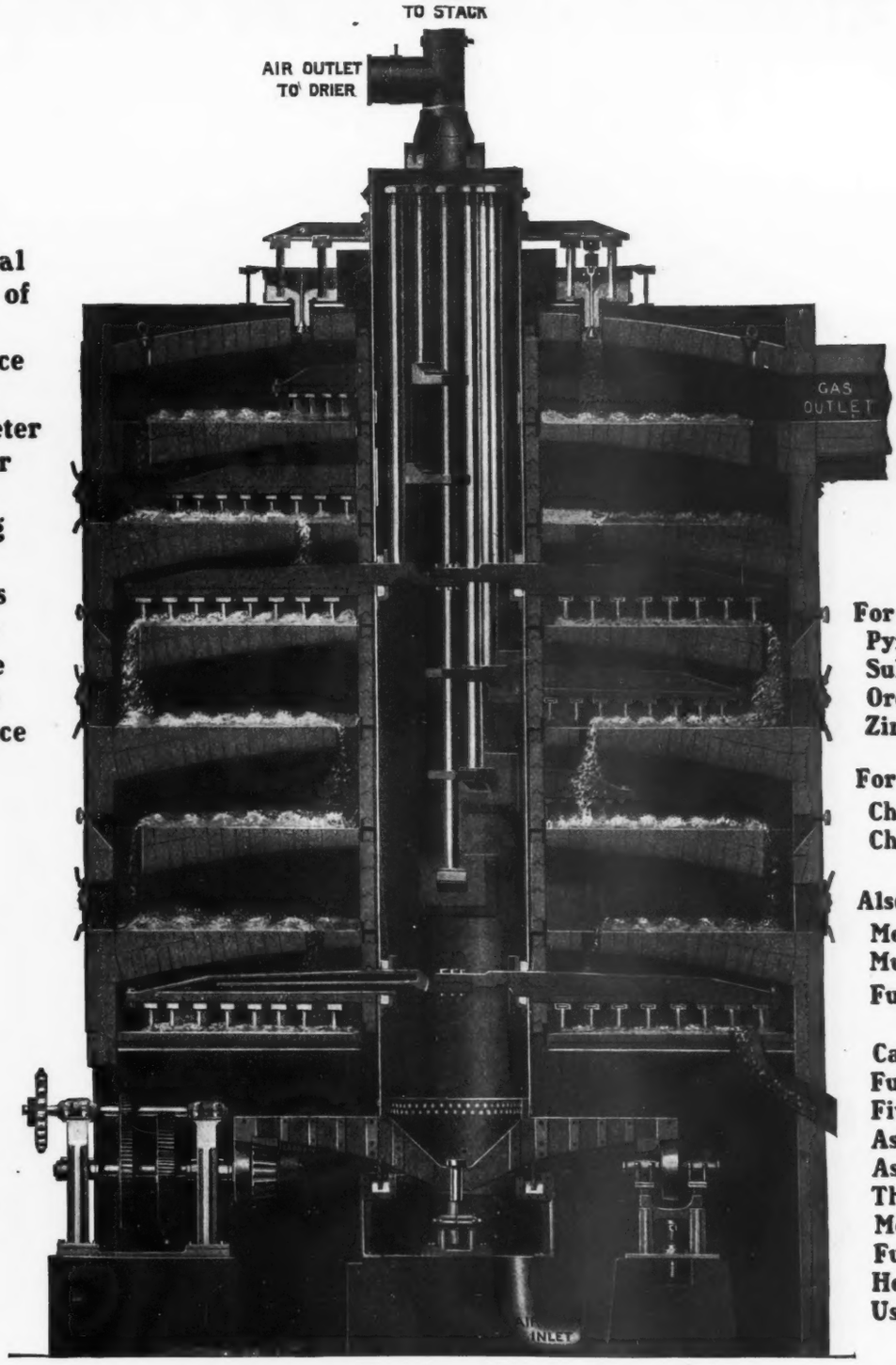
409-415 E. Third St., LOS ANGELES | 576-584 Mission St., SAN FRANCISCO

U. S. A.

The Wedge Furnace



The vertical shaft of this furnace has a diameter of four feet, giving easy access to the centre of the furnace

For Roasting:
Pyrites Fines
Sulphuret Ores
Zinc Blende

For:
Chloridizing
Chlorination

Also
Mechanical Muffle Furnaces

Capacity Of Furnace Five Times As Great As That Of The Small Mechanical Furnaces Heretofore Used

For Other Details, Address

Pennsylvania Salt Manufacturing Co.

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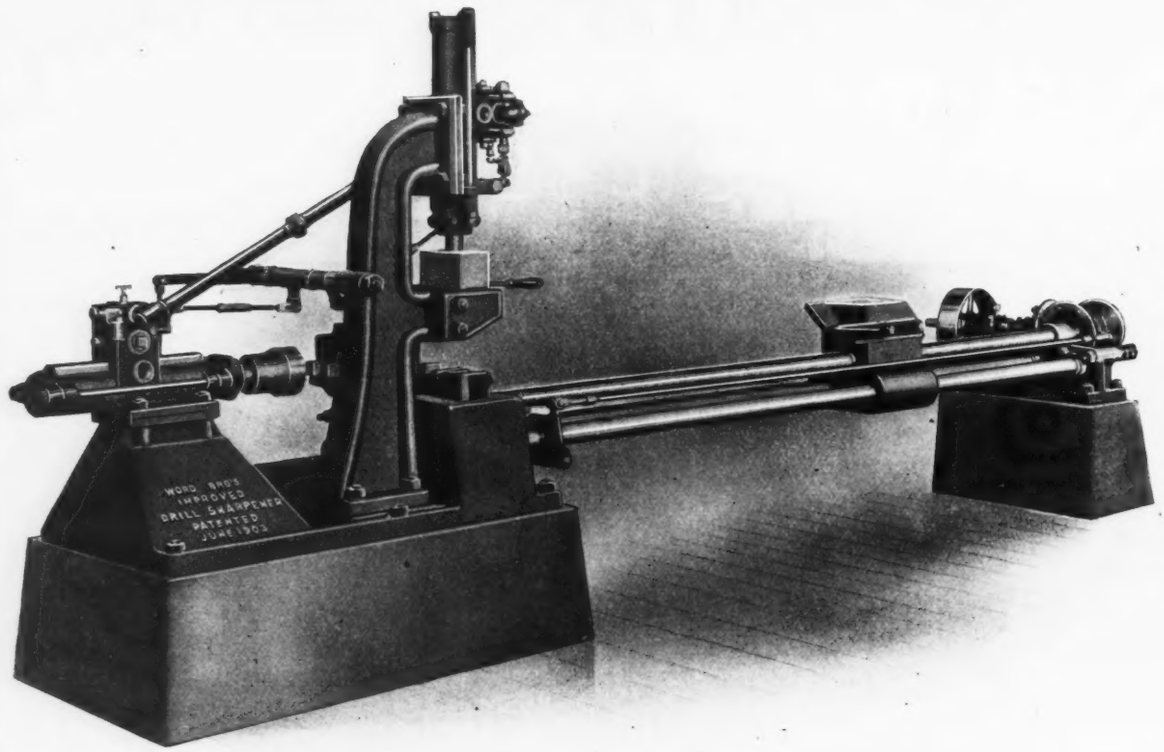
Making and Sharpening Drills At One-Fourth Less Cost



STANDARD MACHINE FOR HANDLING DRILLS UP TO TEN FEET IN LENGTH.

Discarding Its Other Virtues

The Word Drill Maker And Sharpener

1 Has sharpened perfectly 140 drills per hour.

2 Has continued to operate satisfactorily after four years of service.

3 Has dies and dollies that are easy and inexpensive to replace.

4 Has an automatic method of taking up the inevitable wear.

5 Has automatic controlling valves which permit the operator to handle both hammers by a single foot treadle.

We are ready to stake our reputation on this straight hand.

If you think we are "four flushing", it will cost you but one cent to call the bluff.

Manufactured in San Francisco, Cal., Houghton, Mich., Rossland, B. C.

WORD BROS., 60 Castro Street, San Francisco, Cal.

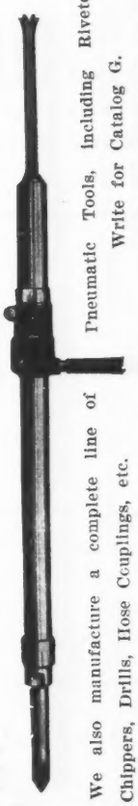
"CLEVELAND" AIR HAMMER DRILLS

INVESTIGATE THEM FOR YOURSELF

They CUT DOWN EXPENSES by Saving TIME, LABOR, POWDER and POWER

SIMPLE and DURABLE—They are unequaled for all kinds of Mine Work.

Write our Mining Dept. for Bulletin No. 10 and Prices.



Pneumatic Tools, including Riveters, Write for Catalog G.

We also manufacture a complete line of Chippers, Drills, Hose Couplings, etc.

THE CLEVELAND PNEUMATIC TOOL COMPANY,
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CONTRACTORS FOR COMPLETE PLANTS

Power, Lighting, Pumping and Mining.

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We are now installing a 50 Stamp Mill and Cyanide Plant for the Nevada Consolidated Mining & Milling Co., Wadsworth, Nevada.

Interior of Cyanide Tank Room—100 Stamp Mill, Tonopah Mining Co., of Nevada.

Milling Machinery

Also a 60-Stamp Mill and Cyanide Plant complete for the TONOPAH BELMONT DEVELOPMENT CO.

Main Office: 63 FIRST STREET, SAN FRANCISCO || Other Branches at { Los Angeles, Seattle, Salt Lake, New York

1860

COLORADO IRON WORKS COMPANY

ORE SMELTING EQUIPMENTS — ORE MILLING MACHINERY

1907

1860 DENVER, COLORADO, U. S. A. 1907

Don't Experiment!

Those embarking in any business making use of a process of any nature would do well to avoid the adoption of methods which are in any measure experimental. This is especially pertinent to the business of

SMELTING

With ore, flux and fuel given, the problem of smelting is a purely manufacturing one, in which methods tried and proven are used successfully and profitably by smelters now in operation. These processes offer every assurance of immediate success when intelligently applied to new ventures. Then why experiment? Follow the lines laid down by those who have achieved success, procure your equipment from a maker whose productions enjoy the highest reputation and——let others experiment.

COLORADO IRON WORKS CO.,
Office and Works: 33rd and Wynkoop Streets,
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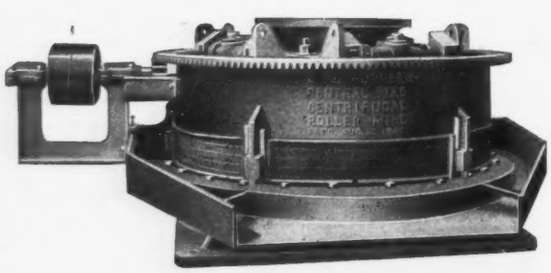
ESTABLISHED 1855

FULTON IRON WORKS

SAN FRANCISCO, CAL.



The Graupner Patent Central Feed Centrifugal Roller Quartz Mill. A great improvement on all other Centrifugal Mills. No wood wedges used. No wood frame required. Even wear on ring die. Entire inside working parts removed at one operation. Send for illustrated catalog.

FULTON IRON WORKS ~ 509 MARKET ST., SAN FRANCISCO, CAL.

Positive Pressure. Particulars on Request.

THE KELLY PATENT FILTER PRESS

SIMPLE for the economic treatment of mill slimes is **NO LEAKAGE**
ECONOMICAL **"THE ACME OF EFFICIENCY."** **NO BREAKAGE**
EFFECTIVE The Tank Pressure Filter which has already **NO VACUUM**
"made good" under actual mill conditions. Cakes easily and quickly discharged in compact form.

THE ADVENT OF THE KELLY PATENT FILTER PRESS MARKS THE COMMENCEMENT OF A NEW ERA IN THE ART OF SLIMES TREATMENT.

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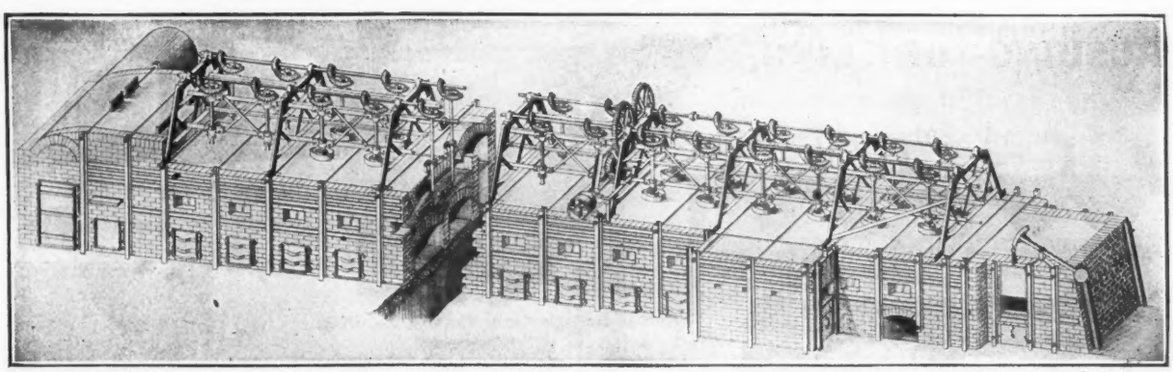
Main Offices and Testing Works: 149-151 Pierpont St., SALT LAKE CITY, UTAH, U. S. A.

Edwards Ore-Roasting Furnaces

Tilting, Simplex and Duplex types—for all kinds of Ore Roasting.



DUPLEX.

These furnaces are roasting successfully today ores containing Gold, Silver, Copper, Zinc, Cobalt Lead, Arsenic, etc., for after treatment by

SMELTING, CYANIDE CHLORINATION OR OTHER METHODS

THEY ARE NOT DUST PRODUCERS

It Will Pay You to Know All About These Furnaces.

CHISHOLM, MATTHEW & CO., COLORADO SPRINGS, COLO., AGENTS

T. EDWARDS, Ballarat, Australia, Patentee and Owner.

ROBINS BELT CONVEYORS

FOR ALL HANDLING OF COARSE OR CRUSHED ORE AT MINE. MILL OR SMELTER, AT THE LOWEST COST PER TON ATTAINABLE.

The illustration shows a Robins Belt Conveyor at a Magnetic Separating Plant taking coarse crushed ore from storage to fine crushers.

Our conveyors have great carrying capacity and are very durable, even under the hardest service. Freedom from break-downs and economy of power mean much to mine owners. The Robins system is ideal and unsurpassed.

WRITE FOR ORE HANDLING BULLETIN NO. 16.

ROBINS CONVEYING BELT COMPANY,

PASSAIC, NEW JERSEY.

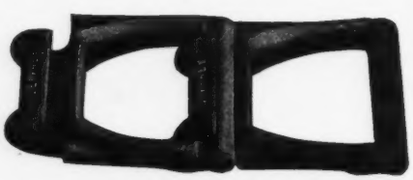
RAILWAY EXCHANGE, CHICAGO. 16 Park Row, New York. 53 STATE STREET, BOSTON.

JEFFREY MACHINERY

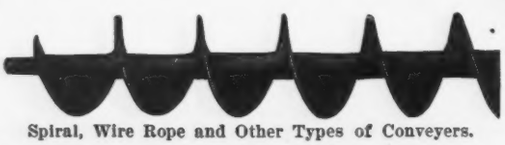
FOR

ELEVATING—CONVEYING—MINING—CRUSHING—DRILLING.

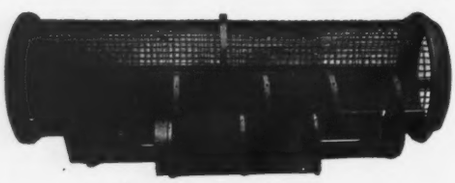
Rubber Belt Conveyer Catalog No. 67-A.



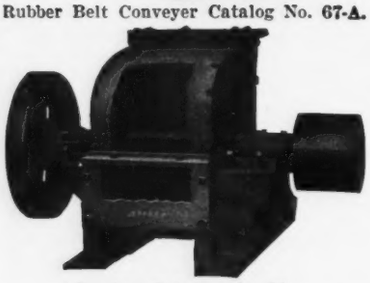
Chain Catalog No. 80.



Spiral, Wire Rope and Other Types of Conveyers.



Screen Catalog No. 69.



Crusher Catalog No. 31.

Drill Catalog No. 76.

All Catalogs Free.

Correspondence Invited.

The Jeffrey Mfg. Co., Columbus, Ohio, U. S. A.

New York Chicago Boston Pittsburg St. Louis Denver Montreal, Can.

Giant Belting

Towers Above Other Belts

just as a giant towers above ordinary men.

"Giant" Belting stands in a class by itself, because it is made in a *different* and *better* way.

Look at the illustration and you'll readily note wherein it differs from others. Doesn't it look stronger—more durable? *It is.*

THE ORIGINAL STITCHED BELT.
THE BEST BELT EVER MADE.
REVERE RUBBER CO.
NONE GENUINE GIANT WITHOUT BRAND
SEAMLESS AND STITCHED

This original stitched belt should appeal to you from the standpoint of *economy*, if nothing more. It has *longer life* than any other—*greater efficiency*.

Ask our nearest branch for prices.

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Factories: Chelsea, Mass., U. S. A.

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RETARDING CONVEYOR

Takes coal from the tipple to cars down a 35° slope, 465 feet long, at the rate of 250 tons an hour.

LINK-BELT APPARATUS FOR THE MINE

contain all the elements that make for profitable operation: thorough study of local conditions guarantees the proper equipment; simple design and rugged construction warrant few parts and great wear-resisting qualities.

Conveyors, car hauls, box-car loaders, crushers, complete washery and tipple equipments.

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DENVER, Lindrooth, Shubart & Co. — NEW ORLEANS, Wilmot Machinery Co.

DEARBORN DRUG AND CHEMICAL WORKS,
WM. H. EDGAR, FOUNDER
MANUFACTURING AND ANALYTICAL CHEMISTS AND ENGINEERS

If you will give us an opportunity to treat your
BOILER FEED WATER
you can depend upon absolute relief from the troubles you are experiencing, whether Scale, Corrosion, Pitting or Foaming. Our knowledge of the subject of Water Treatment, years of practical experience, and thoroughly equipped Laboratories, under the direction of expert Chemists, all combine to place us far in the lead in this line of work.

We would like to explain our methods to you and submit proposition. Will you not write us?

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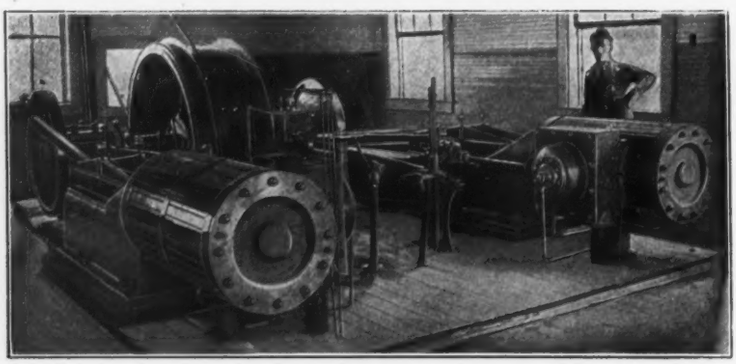
BRANCH OFFICES IN 20 OTHER CITIES OF THE U. S.

DANVILLE

WE ARE BETTING ON A SURE THING



We've spent 30 years and a great deal of money acquiring a reputation as builders of dependable hoists. We can't afford to stake that reputation on anything doubtful but we readily stake it on DANVILLE HOIST EFFICIENCY and ECONOMY.

PARTICULARS?

DANVILLE FOUNDRY & MACHINE CO., Danville, Ill., U. S. A.

HOISTING ENGINES

FORT WAYNE ELECTRIC WORKS
WOOD SYSTEMS

Multiphase Alternators Direct-Connected

Type TRE three-phase Revolving Field Alternator

A neat, highly efficient alternator, slow speed, liberal design, very rigid construction The best ventilated alternator on the market allowing all material to be worked at a higher efficiency.

See our Exhibit at the Electrical Show, Chicago, Jan. 13-25, 1908. 641

Other Sales Offices — Main Office Fort Wayne, Ind. — In Most Large Cities

C-W
Induction Motors

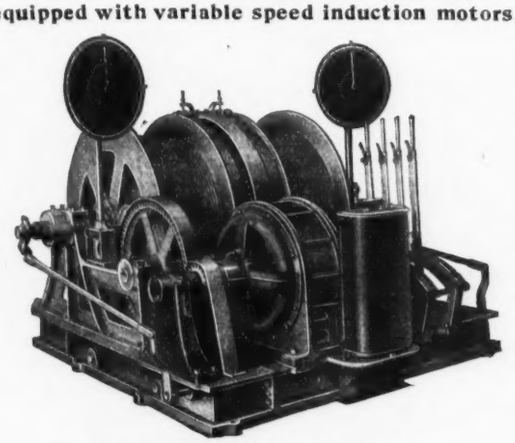
See Bulletin 88 P.

are built by a company that has been satisfying its customers since 1888.

CROCKER-WHEELER COMPANY
Works: Ampere, N. J.
PITTSBURG, DENVER, SAN FRANCISCO, ETC.

General Electric Company

Electric Mine Hoists
equipped with variable speed induction motors.



Double friction drum electric mining hoist with alternating current 550, 440 or 220 volt motors.

The economy and reliability of the General Electric Company's induction motor has secured its universal adoption.

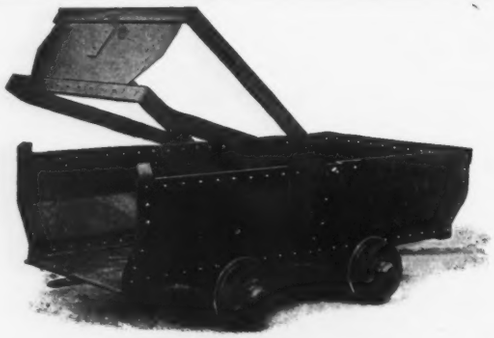
Motors in sizes from 15 to 150 H. P. Hoists lift from 1500 to 6500 lbs. with single line. 1523

New York Office: 44 Broad St. — PRINCIPAL OFFICE: Schenectady, N. Y. — Sales Offices in all large cities.

WESTERN ELECTRIC COMPANY
NEW YORK SAINT LOUIS SAN FRANCISCO DENVER PITTSBURGH OMAHA ATLANTA INDIANAPOLIS
CHICAGO
PHILADELPHIA SAINT PAUL CINCINNATI KANSAS CITY DES MOINES SALT LAKE CITY LOS ANGELES SEATTLE

A WIDE MARGIN of safety—that's what you get in W. E. Hoist Motors. They are designed to operate in this manner. They are completely enclosed and are especially adapted to intermittant service. They will work equally well under all atmospheric conditions. The frame is rigid and will withstand almost any strain. They will not spark even under the heaviest loads.

Our Bulletin No. 3060-G will tell you about them.



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If dissatisfaction has been yours in the past it is all the more reason you get in touch with us. We can prove to you that QUALITY and LASTING ENDURANCE can be had at reasonable prices—whether from stock or made to order.

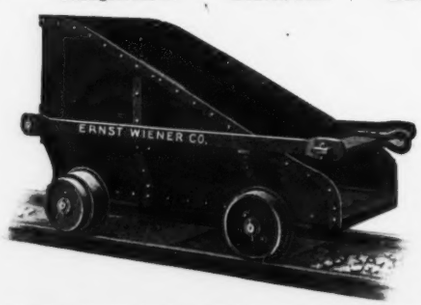
Shall We Estimate?

ARCHER IRON WORKS
Chicago, Ill., U.S.A.

We Have Your Attention

Now let us talk business on Mine Cars, Skips, etc. We offer all the inducements a good manufacturer can in the way of material, deliveries and prices; but above these, we offer our 20 years' experience in guiding you to obtain the best design of car suited to your requirements, a factory equipped with special machinery for car construction, and a large stock of Rails, Portable Track, Frogs, Switches and Mine Cars. Department 15 solicits your correspondence and will send Catalog E upon request.

RAILROAD SPECIALISTS FOR ALL INDUSTRIES.
ERNST WIENER COMPANY
BEAVER AND BROAD STREETS, NEW YORK.
Boston. Youngstown, O. Denver, Colo. Bisbee, Ariz.



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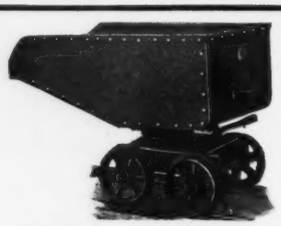
For Contractors, Pile Driving, Quarry and Mine Duty.

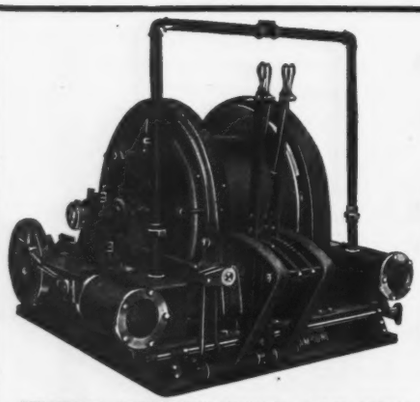
Also tail rope haulage, inclines, slate machinery and suspension cableways. Ask for catalog. Satisfaction guaranteed.

S. FLORY MFG. CO., - Bangor, Pa.



No. 528. Scoop Rotary Mine Car.

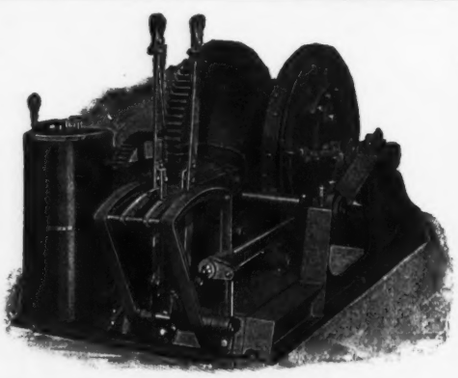
Complete Equipment for
MINING and INDUSTRIAL RAILWAYS,
STEEL and WOODEN CARS,
Switches, Turntables. Light Rails Carried in Stock.
Send for Catalogue No. 42.
WONHAM & MAGOR CO.,
New York, 29 Broadway.
Boston, 141 Milk St. Works, Passaic, N. J.



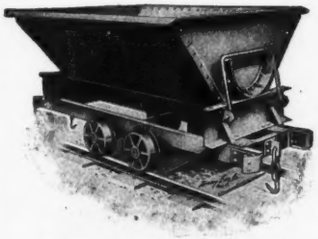
"Samson" Hoists
Steam and Electric.

Samson Hoists of all types are high grade machines.

Bulletins upon application.



THE ENGLISH IRON WORKS COMPANY, Kansas City, U. S. A.



V-Body Rocker Dump Car.

Do You Want The Best?

WE HAVE IT IN

ORE, MINE and INDUSTRIAL CARS.

BUILT TO ANY CAPACITY.

Send us your Specifications.
Prices Right. Delivery Prompt

We wish you to have our No. 36 Steel Car Catalog. Shall we mail it?

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Kilbourne & Jacobs Mfg. Co.,
COLUMBUS, OHIO.

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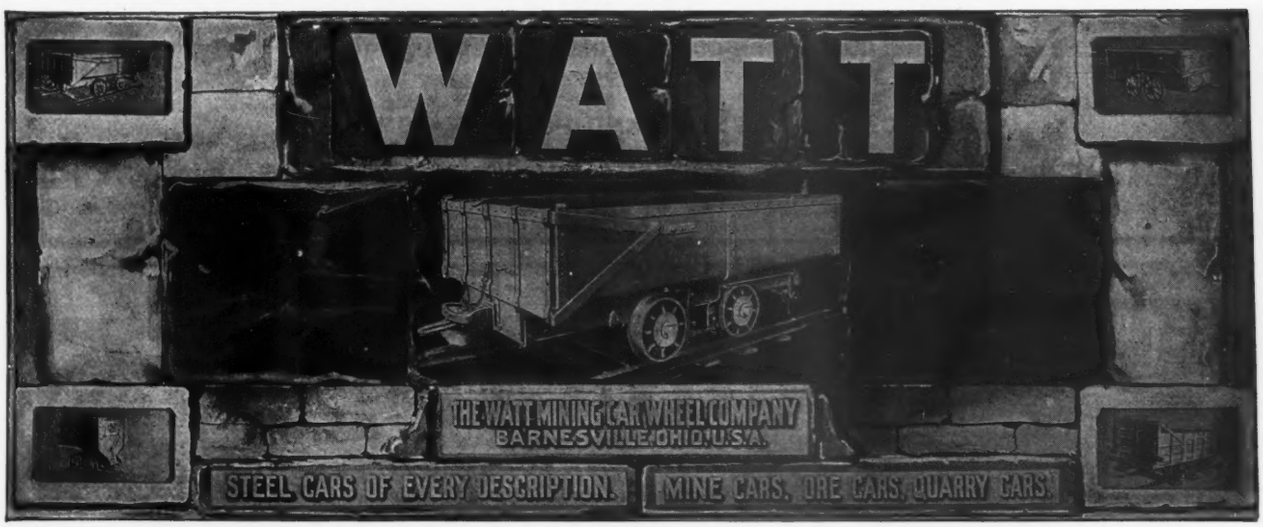
Charging Car.

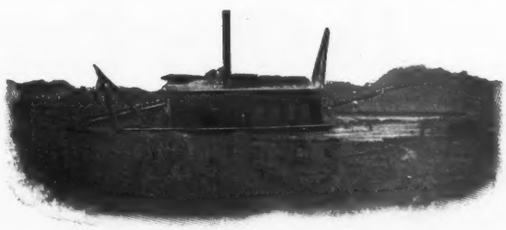
Hopper Bottom Car.

Gable Bottom Car


WATT
THE WATT MINING CAR WHEEL COMPANY
BARNESVILLE, OHIO, U.S.A.
STEEL CARS OF EVERY DESCRIPTION.
MINE CARS, ORE CARS, QUARRY CARS.

GOLD DREDGES

Built by American Locomotive Company **From Designs by A. W. Robinson, M. Am. Soc. C. E.**



ATLANTIC EQUIPMENT COMPANY,

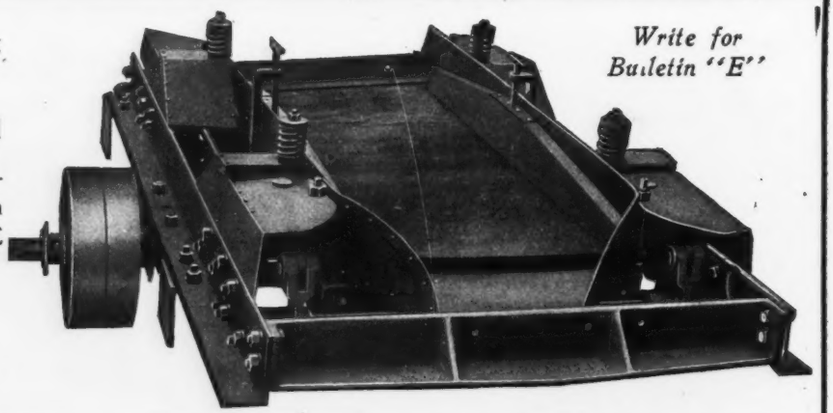
Railway Exchange, Chicago **111 Broadway, New York**

Why lose time and money in changing trommel cloth when by the use of the

Imperial Ore Screen

it may be avoided, as we GUARANTEE that the screen frame and pan, in wet work, can be changed in THREE MINUTES. Think it over.

JOHN A. TRAYLOR MACHINERY COMPANY,
Denver, Colo., U. S. A.



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MANGANESE STEEL CASTINGS

FOR ALL KINDS OF

MINING, MILLING AND DREDGING MACHINERY

WE GUARANTEE OUR CASTINGS TO BE EQUAL TO THE BEST

AMERICAN BRAKE SHOE AND FOUNDRY COMPANY,
CHICAGO, HEIGHTS, ILLINOIS.

WE CONVEY AND ELEVATE EVERYTHING.
TACKS, SAND, ROCK, ORES, RED HOT IRON, MOLTON SLAG, COAL AND SALT.
CONVEYORS AND ELEVATORS MADE BY
THE C.O. BARTLETT & SNOW CO.
CLEVELAND, O.

ROTARY DRYERS

WE MAKE THE LARGEST VARIETY IN THE WORLD
More than 200 now in use. Gold Medal at St Louis
NOW USED IN THE GOV. COAL TESTING PLANT
THE C.O. BARTLETT & SNOW CO. CLEVELAND OHIO USA

FLEXIBLE STEEL-ARMORED HOSE

This steel-armored hose consists of the best quality of rubber hose, closely covered with a metal armor composed of a single strip of highly galvanized steel, wound spirally and interlocking as shown in the above cut.

The life of ordinary rubber hose when subjected to high pressures is limited by the constant expansion and contraction of the hose, which works rapid deterioration. If this expansion and contraction can be eliminated, the life of the hose will be greatly prolonged, and it is exactly this result that we accomplish by the use of our flexible steel armor. The armor fits the hose so closely as to absolutely preclude expansion, and, with this possibility eliminated, the hose gains in strength and durability in proportion to the retaining strength of the armor. An idea of the immense pressure which the armor enables the hose to endure, is conveyed by the fact that a one-inch three-ply rubber hose, equipped with our armor, will stand a hydraulic pressure of 2000 pounds. In short, the hose acts merely as a packing, as all the stress is concentrated on the steel armor.

Write for a copy of bulletin No. 50732.

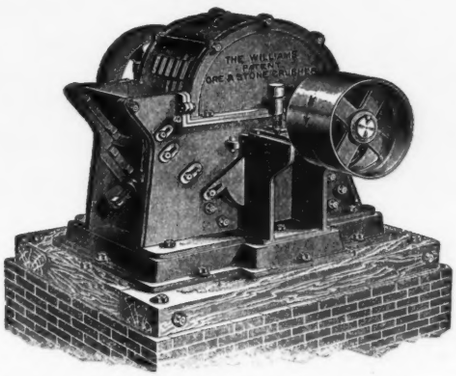
SPRAGUE ELECTRIC COMPANY,
General Offices: 527-531 West 34th Street, NEW YORK CITY.

Coal Crushers

WILLIAMS PATENT HAMMER TYPE

Crush Coal

For Coke Ovens, Gas Plants and Stokers



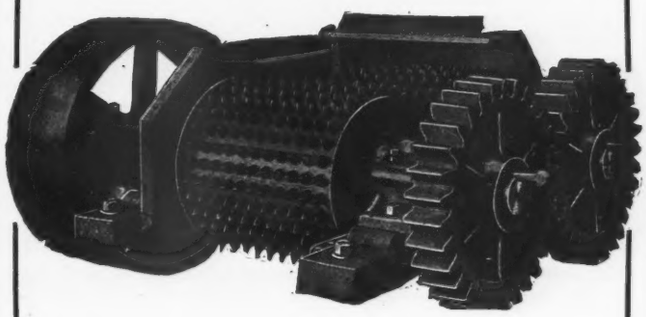
Any Capacity for Fineness Desired

1200 now in use. Write for Bulletin No. 5

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

Works, ST. LOUIS. Old Colony Bldg., CHICAGO

COAL CRUSHING MACHINERY?

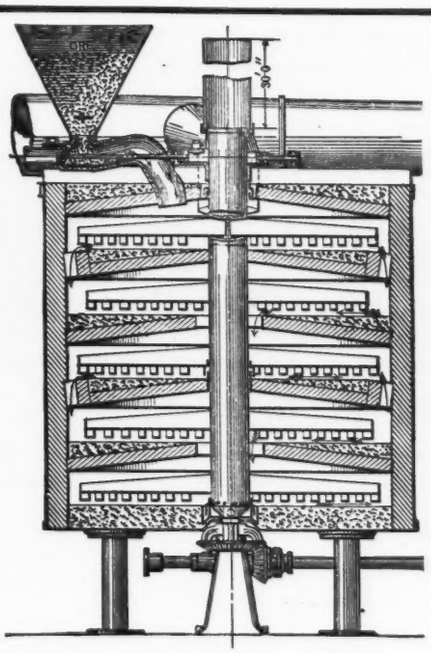


Let us know what you wish to crush —number of tons you want to prepare per hour—size you want to crush to, and we'll furnish detailed specifications covering your needs.

Let us hear from you.

VULCAN IRON WORKS,

WILKES-BARRE, PA., U. S. A.



NICHOLS COPPER COMPANY,

25 BROAD STREET, NEW YORK.

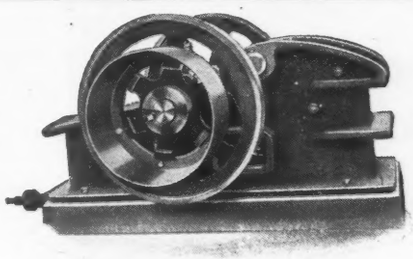
The Herreshoff Roasting Furnace

For Desulphurizing Ores

For Particulars see Page 237, Mineral Industry, Vol. VI, or apply to Manufacturers.

BUCHANAN ALL-STEEL JAW CRUSHER

Simplest, Strongest and Most Durable Machine Made.



The frame is a solid steel casting made in one piece.

The pitman and swing jaw are made of solid open hearth steel castings.

The crusher can be adjusted to crush fine or coarse.

It is free from light and trappy connections.

The head room required is low, making it convenient to feed and especially desirable for mining purposes.

The eccentric shaft is of the best quality of hammered steel and made extra long so that a pulley can be placed upon it for operating a screen or an elevator, if necessary.

All joints are machined. All wearing parts are reversible.

The jaw plates are of chilled charcoal iron; or, of manganese steel.

Made in Three Sizes: 7"x14", 10"x16" and 13"x24".

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PHILADELPHIA and NEW YORK.

C. G. BUCHANAN, Consulting Engineer,

Department of Crushing Machinery, 90 West Street, New York, U. S. A.

HARBISON-WALKER REFRACTORIES CO.

PITTSBURGH, PA.

Makers
Highest Grade Refractories
Importers
Chrome Ore
Sole Agents
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Fire Clay, Silica, Magnesia, Chrome

BRICK

Fire Clay, Silica, Magnesia and Chrome Brick for Copper Blast Furnaces, Settlers, Reverberatories, and Converters. Bullion Furnaces, Lead Softening and Refining Furnaces, etc.

7,500 Regular Customers

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1,200,000 Daily Capacity

"Christy" Plant Formerly Christy Fire Clay Co.

FIRE-BRICK

"Laclede" Plant Formerly Laclede Fire Brick Mfg. Co.

MADE FROM

HIGH GRADE FLINT CLAYS AND BAUXITE

Especially adapted for smelting furnaces where a high grade refractory is necessary. Copper furnaces, lead refining furnaces, etc.

Write for our FIRE BRICK CATALOG.

Laclede-Christy Clay Products Co.,

St. Louis, Mo.

Case Combination Furnace.

CASE GASOLENE FURNACES

Cost less to Install and Operate than any on the Market

CRUCIBLE MUFFLE COMBINATION

The Denver Fire Clay Company,

Manufacturers and Importers of Assayers' and Chemists Supplies

DENVER, COLO., U. S. A.

Panama Two-part Dipper Teeth · Shovel Dipper Lips · Dredge Bucket Lips · Ore Washing Blades · Shaking Screens · Jaw Plates · Concaves · Mantles · Heads
Mine Car Wheels · Crane Wheels · Skip Wheels · Barrow Wheels · Sprocket Wheels · Sheave Wheels · Link Belting · Gearing · Pinions · Road Scrapers · Spouts and Linings · Placer Dredge Parts · Traction Rolls · Tread Plates · Window Guards · Bone Rolls
Corrugated Rolls · Plain Roll Shells · Special Railroad Work · Frogs · Switches · Centers · Safes · Vaults · Screen Plates · Conveyor Blades · Beater Blades · Dry Pans · Tumblers · Pins · Grizzly Bars

TRADE **TISCO** MARK

The Individuality of "TAYLOR MADE" Castings causes operators and owners to specify them—

FOR ECONOMY'S SAKE!

MANGANESE STEEL

HARDNESS, TOUGHNESS, STRENGTH.

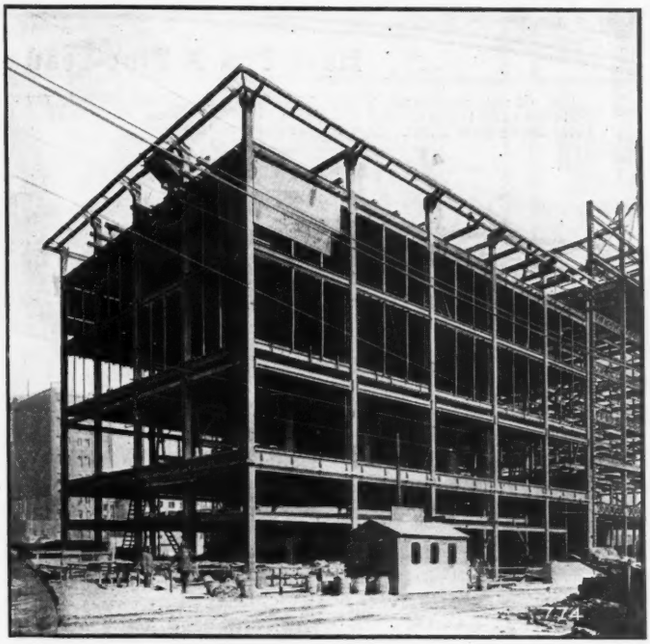
Special Steels for Special Places. *Lowest Price Consistent with High Quality!*

TAYLOR IRON & STEEL COMPANY,

HIGH BRIDGE, NEW JERSEY.

Kominuter Plates · Tumbler Wearing Plates · Door Guards for Jails · Concrete Mixer Blades · Toothed Roll Segments · Road Roller Picks

American Bridge Company of New York



Lent Estate Building, San Francisco, Cal.

Structural Steel For Every Purpose

Annual Capacity 750,000 Tons

General Offices **42 Broadway, New York.**

SHULTZ BELTING Co. SHULTZ PATENT SABLE RAWHIDE BELTING

Send For A Piece Of Shultz Sable Belting

Test it and examine it. Notice how much more flexible it is than oak-tanned belting. This enables it to lie closer to the pulley.

Sable Rawhide is for dry drives; for drives exposed to water, steam or acid fumes, use Shultz "Aqua" Belts. You can run "Aqua" in a tank of boiling water if you wish, and the plies or joints will not separate; it will keep right on transmitting power. It is the belt to use where woven belts, rubber belts and doped belts give out.

Send for a sample.

Shultz Belting Co.,

ST. LOUIS, MO.

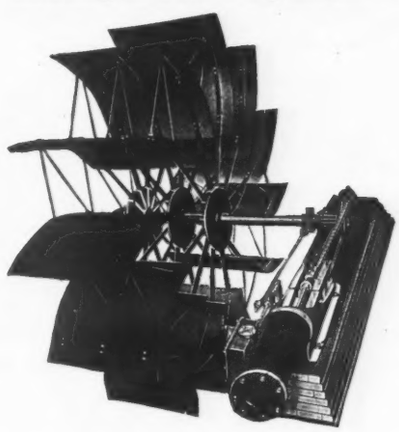
Boston New York Philadelphia

19 A

CRAWFORD & McCRIMMON CO.

VENTILATING FANS

Hoisting and Hauling Engines



A National record of twenty-eight years. Accepted as the standard for every day in the year service and year after year. The highest efficiency without high speeds. The fan that is a good investment. The thousands of pleased users say much more.

CATALOG ?

Established — Brazil, Indiana, U.S.A. — 1869

The DEISTER CONCENTRATOR

Have You A Zinc-Lead Ore?

One of our customers writes as follows:— "We are able to make a perfect separation of the lead and zinc both minerals being absolutely clean, this we have never been able to do with our other tables."

Write for Catalog.

THE DEISTER CONCENTRATOR CO., Ft. Wayne, Ind.

JIGS
MAGNETIC SEPARATORS
COAL WASHING MACHINERY

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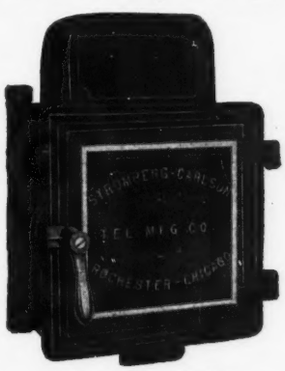

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ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Abendroth-Root Mfg. Co.	50
Ainsworth & Sons, Wm.	57
Allentown Rolling Mills	54
American Air Compressor Works	46
American Bridge Co.	33
American Brake Shoe & Fdry. Co.	30
American Concentrator Co.	34
American Gröndal Kjellin Co.	51
American Metal Co., Ltd.	70
American Process Co.	47
American Smelting & Ref. Co.	71
American Spiral Pipe Works	50
American Zinc Lead & Smelting Co.	69
Archer Iron Works	28
Arizona Copper Co.	46
Atlantic Equipment Co.	29
Atantic Mining Co.	68
Avery, C. M.	60
Bacon, E. C.	46
Baerwald, E.	39
Baker & Co., Inc.	59
Balbach Smelting & Refining Co.	39
Baldwin Locomotive Works.	45
Baltimore Copper Smelting & Rolling Co.	72
Bartlett & Snow Co., C. O.	30
Baszanger & Co., J.	53
Beer, Sondheimer & Co.	70
Berger & Sons, C. L.	56
Berwind-White Coal Mining Co.	47
Bishop & Co., J.	59
Blackwell Sons Co., Geo. G.	43
Blaisdell Co.	41
Bake Mining & Milling Co., The	60
Bradley Engineering & Mach. Co.	59
Braeburn Steel Co.	51
Brandis Sons & Co., F. E.	58
Braun, F. W.	18
Bristol Co., The	56
Britannia Smelting Co., The	72
Broderick & Bascom Rope Co.	73
Brown Hoisting Machry Co.	45
Bruner & Co., R. E.	69
Bucyrus Co.	58
Buff & Buff Mfg. Co.	56
Buffalo Forge Co.	53
Buffalo Steam Pump Co.	53
Bury Compressor Co.	44
Butters Patent Vacuum Filter Co., Inc.	41
Caldwell & Son Co., H. W.	51
Carnahan Mfg. Co., C. T.	14
Castner, Curran & Bullitt.	47
Chalmers & Williams	3
Channon Co., H.	40
Chisholm, Matthew & Co.	23
Chrome Steel Works	44
Cleveland Pneumatic Tool Co.	21
Colo. Iron Works Co.	22
Connersville Blower Co.	47
Consolidated Mining & Smelting Co., of Canada	72
Contractor's Supply & Equipment Co.	51
Crawford & McCrimmon Co.	33
Cresson Co., G. V.	31
Crocker-Wheeler Co.	27
Cyclone Drill Co.	52
Danville Foundry & Machine Co.	26
Davenport Locomotive Wks.	45
Davis Iron Wks., The F. M.	44
Dayton Globe Iron Wks. Co.	49
Dearborn Drug & Chemical Works	26
Deister Concentrator Co.	34
De Laval Steam Turbine Co.	54
Deming Co., The	53
Denver Balance Co.	56
Denver Eng. Works Co.	7
Denver Fire Cay Co.	32
Diefendorf & Co.	47
Dietzgen Co., Eugene	56
Dings Electro-Magnetic Separator Co.	60
Dixon Crucible Co., Jos.	51
D'Olier Engineering Co.	53
Douglas Copper Co.	71
Dupont de Nemours Powder Co., E. I.	50
Elmer & Amend.	57
Elliott's Metal Co.	69
English Iron Works Co.	28
Eng. Works of Wonham & Magor	28
Flory Mfg. Co., S.	28
Fort Wayne Electric Works	27
Frenier & Son, J. H.	58
Fulton Iron Works	22
Gardner Electric Drill & Machinery Co.	53
General Electric Co.	27
Granby Mng. & Smelting Co.	69
Green Fuel Economizer Co.	42
Gurley, W. & L. E.	58
Harbison-Walker Refractories Co.	32
Harrington & King Perf. Co.	42
Heil Chemical Co., Henry	56
Heine Safety Boiler Co.	49
Hendrick Mfg. Co.	43
Hendrie & Bolthoff Mfg. & Supply Co.	4
Hendy Iron Wks., J.	1
Hug Water Wheel Co., The	49
Hunt Co., C. W.	47
Illinois Zinc Co.	72
Ingersoll-Rand Co.	8, 9
Jeanesville Iron Works Co.	55
Jeffrey Manufacturing Co.	24
Jenkins Bros.	73
Kelly Filter Press Co.	23
Kent Mill Co.	60
Keuffel & Esser Co.	56
Keystone Test Drill Co.	52
Kilbourne & Jacobs Mfg. Co.	29
Kingsford Fdry. & Mach. Works	54
Knowles Steam Pump Works	54
Kohlbusch, H.	56
Koppel Co., A.	15
Laclede-Christy Clay Products Co.	32
Laidlaw-Dunn-Gordon Co., The	54
Ledoux & Co.	71
Leffel & Co., Jas.	49
Leschen & Sons Rope Co., A.	51
Lewis & Co., H. F.	58
Leyner Engr. Works, Co., J. Geo.	12
Lima Loco. & Mach. Co.	45
Link Belt Co.	25
Lufkin Rule Co.	56
Luna Lead Company	72
Mathison & Co.	46
Matthiessen & Hegeler Zinc Co.	69
McKiernan Drill Co.	53
McLanahan-Stone Mach. Co.	51
Mine & Smelter Supply Co., The	16
Morava Construction Co.	47
Moore & Co., C. C.	21
Morris Machine Works	55
Mountain Copper Co., Ltd., The	58
New York Engineering Co.	52
Nichols Copper Co.	31, 39
Nordberg Mfg. Co.	10
Norris, J. L.	46
Northern Elec. Mfg. Co.	58
Norwalk Iron Wks. Co., The	44
Ogden Assay Co.	47
Orford Copper Co.	39
Pass & Son, C.	69
Pelton Water Wheel Co.	49
Pennsylvania Salt Mfg. Co.	19
Penn. Smelting Co.	72
Perrin & Co., W. R.	44
Peyton Chemical Co.	69
Phelps, Dodge & Co.	69
Phosphor Bronze Sm. Co.	59
Pierce, L. S.	60
Pittsburg Coal Washer Co.	46
Porter Co., H. K.	45

ALPHABETICAL INDEX TO ADVERTISERS

	PAGE
Power & Mining Mach. Co..	6
Prescott Steam Pump Co...	55
Pulsometer Steam Pump Co.	54
Redwood Mfgrs. Co.....	73
Revere Rubber Co.....	25
Richardson & Co., Inc.....	59
Ricketts & Banks.....	40
Robins Conveying Belt Co...	24
Roessler & Hasslacher Chemical Co.	39
Roper Morgans Mchry. Co..	59
Saginaw Manufacturing Co.	56
Salt Lake Hdware Co., The	56
Schieren & Co., C. A.....	47
Scottdale Fdry. & Mach. Co.	51
S. H. Supply Co.....	59
Shriver & Co., T.....	44
Shultz Belting Co.....	33
Slipp-Butler Co.	69
Smith Co., S. Morgan.....	58
Smooth-On Mfg. Co.....	59
Solvay Process Co.....	47
Sprague Electric Co.....	30
Standard Diamond Drill Co.	53
Stephens-Adamson Mfg. Co.	2
St. Joseph Lead Co.....	69
St. Louis Smelting & Ref. Co.	72
Stoddard Incorporating Co..	47
Stromberg Carlson Telephone Mfg. Co.....	39
Sturtevant Mill Co.....	17
Sturtevant Co., B. F.....	49
Sullivan Machinery Co.....	74
Sutton, Steele & Steele, Inc.	11
Syracuse Smelting Works...	47
Tate, Jones & Co., Inc.....	47
Taylor Iron & Steel Co....	32
Tennant, Sons & Co., C.....	39
Thomson Mining Co.....	47
Tibbals, W. H.....	46
Traylor Engineering Co....	13
Traylor Machinery Co., J. A.	30
Trenton Iron Co.....	48
Tyee Copper Co., The.....	72
Union Elevator & Mach. Co.	58
United Iron Works Co., Springfield	60
United Metals Selling Co...	39
United States Smelting, Refining and Mining Co....	70
Vanadium Alloys Co.....	69
Vogelstein & Co., L.....	71
Vulcan Iron Works, Toledo	46
Vulcan Iron Works, Wilkes-Barre	31
Watt Mining Car Wheel Co.	29
Webb City & Carterville Fdry. Mach. Co.....	58
Weber & Co., F.....	58
Webster Mfg. Co.....	41
Wellman-Seaver-Morgan Engineering Co.	5
Western Chemical Mfg. Co..	39
Western Elaterite Roofing Co.	58
Western Electric Co.....	27
Western Engineering & Construction Co.	52
Westinghouse Elec. & Mfg. Co.	45
Wetherill Magnetic Separating Process	60
Wiener Co., E.....	28
Williams Patent Crusher & Pulverizer Co.	31
Wissler Instrument Wks....	56
Wolverine Copper Mining Co.	68
Wonham & Magor Co.....	28
Word Bros.	20
Worthington, H. R.....	54
Wood & Co., R. D.....	53
Wyckoff & Son Co., A.....	50
Yale & Towne Mfg. Co.....	58
York Bridge Co.....	43
Young & Sons.....	57

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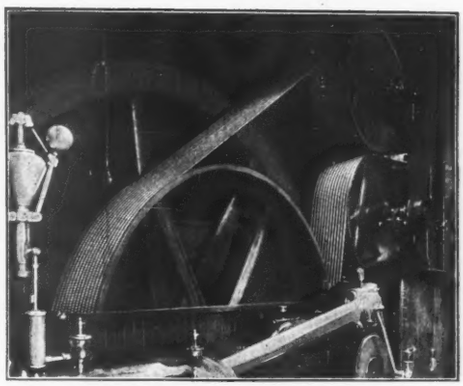

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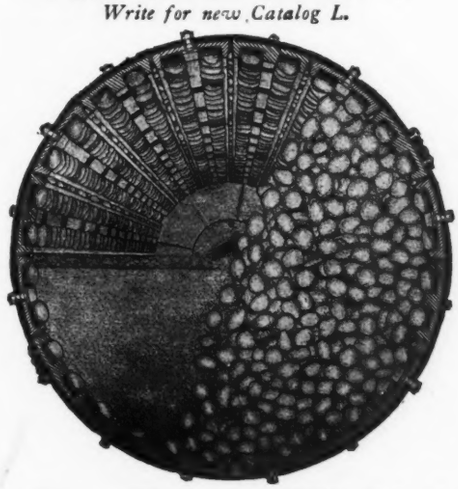

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You Can Positively Secure An Increased Extraction by grinding your Ore fine and treating with a

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Successful extraction depends upon the economical application of **Labor, Power** and **Water.**

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Virginia City, Nevada, U. S. A.

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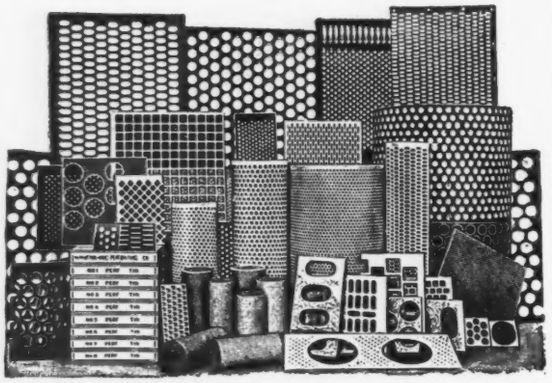

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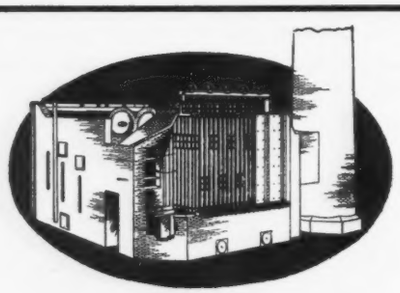

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(Sole builders of the Green Fuel Economizer in this country.)
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BUYERS'

Alphabetical Index to Advertisers 40
Air Compressors 5, 8, 9, 10, 12, 16, 44, 46, 53
Alloys 43
Alternators 27
Amalgamators 60
Arc Lamps 27
Assayers 40, 47, 68, 71
Assayers' and Chemists' Supplies 18, 56, 57, 58

Balances, Assayers' 18, 56, 57, 58
Ball Mills, Liner, Plates and Balls 5, 44
Barrows 28
Belting 25, 33, 47
Belt Lacing Steel 56
Blowers 47, 49
Boilers 49
Boiler Compounds 5, 26, 59
Brick Machinery 32
Briquetting Machinery 51
Brokers (Mining, Lands and Stocks) 46, 47
Buckets, Elevator 5, 6
Burners 18

Cages 5, 51
Cam Shafts for Stamp Mills 44
Carbons 53
Cars (Dump, Mine and Ore) 5, 12, 15, 28, 29
Castings 30, 32
Chain Blocks 58
Channeling Machines 8, 9, 74
Chemicals 40, 71
Chemists 40, 71
Chrome Ores 43
Chrome Steel Castings and Forgings 44
Classifiers 34
Clutch, Friction 51
Coal and Coke Producers and Dealers 46, 47
Coal Cutters 8, 9, 74
Coal and Ore Handling Machines 2, 5, 6, 24, 25
Coal Mining and Washing Machinery 8, 9, 15, 34
Coal Punchers 74
Concentrators 3, 4, 11, 13, 16, 34
Concrete Mixers 51
Conveyers 2, 5, 6, 10, 24, 25, 41, 47
Copper Converters 4, 5, 6
Copper Furnaces 5, 8
Crane Motors 58
Cranes 5, 45
Crucible, Graphite, etc 51
Crucible Steel Castings 44
Crusher Rings, Steel 44
Crushers ..... 3 to 24, 31, 60
Cupel Machinery 18
Cyanide 39
Cyanide Plants 3, 13, 41, 73
Cyanide Vat Excavators, etc 41

Drafting and Engineers' Materials 56, 57, 58
Dredging Machinery 4, 5, 29, 46, 52, 58
Drill Sharpeners 8, 9, 20
Drill Steel 51
Drills, Air 8, 9, 10, 12, 14, 21, 24, 52, 53
Drills, Core 8, 9, 10, 12, 14, 21, 24, 52, 53
Drills, Hand 8, 9, 10, 12, 14, 21, 24, 52, 53
Driers, Mechanical 30, 47

Electric Rock Drills 8, 9, 74
Electrical Machinery 27
Emery Grinders 58
Engineers 40, 61, 68, 71
Engineers' Instruments 56, 57, 58
Engines, Steam 5, 13, 49
Exhaust Heads 49, 50
Explosives 50

Fan Motors 7, 27, 58
Fans (Mine Ventilating) 27, 33, 49, 58
Feed Water Purifiers 73
Filters 3, 41
Filter Presses 23, 44
Fire Brick 32
Fire Clay 32
Flanges, Forged Steel 50
Fluorspar 39
Forges 49
Foundry Equipment 15, 51
Fuel Economizers 42, 49
Furnaces, Assay 18, 32
Furnaces, Copper 4, 5, 6
Furnaces, Roasting 4, 5, 6, 7, 13, 16, 19, 23, 31
Furnaces, Smelting 4, 5, 6, 7, 13, 16, 19, 23, 31
Fuses 50

Gages 56
Gas and Gasolene Engines 5, 6, 17
Gas Producers 5
Gaskets, Corrugated Copper 50
Gears 6, 51
Generating Sets 27, 49
Generators 5, 27, 58
Graphite 51

DIRECTORY

Alphabetical Index to Advertisers 40
Grinding Mill Machinery ..... 3 to 24, 31, 44

Hoists 4, 5, 7, 12, 26, 27, 28
Hose 25
Hose, Steel-Armored 30

Injectors 73
Insulators 27

Jaw Plates 32
Jigs 3, 16, 34

Laboratory Machinery and Appliances 18
Lead, Pig 40, 69, 70, 71, 72
Link Belting 25
Locomotives 45
Locomotives, Electric 45
Lubricators 73

Manganese Steel 30, 32
Metal Dealers 39, 40, 69, 70, 71, 72
Mills, Mixing 51
Mining and Land Companies 46, 47, 68
Mining Machinery ..... 3 to 23, 30, 31, 44, 58, 59
Mining Plates 4
Motors 27, 49, 58

Nickel Steel 39

Oil Cups 73
Oil Water Purifiers 26
Oil Well Supplies 52, 53
Ore Feeders 3, 34
Ore Purchasers 39, 40
Ore Samplers 18
Ore Screens 4, 13, 24, 30
Ore Testing Works 22

Packing and Pipe Coverings 73
Packing, Rod 73
Paint 51
Perforated Metals 42, 43
Phosphor Bronze 59
Pick Machines 74
Pipe 50
Pipe, Spiral Riveted 50
Platinum 59
Platinum Wire Sheet and Ware 59
Pulleys 56
Pumps 7, 8, 9, 13, 16, 53, 54, 55, 58
Pyrometers 56

Railroad Equipment and Supplies 15, 28, 29
Rams, Hydraulic 49
Rare Minerals 43
Recording Instruments 49
Rolls, Crushing 3, 7, 17, 34
Roofing 58
Roofing Elaterite 58
Rules, Steel 56

Screens, Mining 4, 13, 24, 30
Second-hand Machinery 59
Separators, Electrical 16, 60
Separators, Magnetic 16, 60
Shoes and Dies for Stamp Mills 3, 44
Shovels, Steam 29, 46, 52, 58
Smelting and Refining Works 22
Stamp Mills 3, 4, 5, 7, 16, 34
Stamp Mill Wearing Parts 44
Steam Goods 73
Structural Steel 33, 43, 47

Tanks 58
Telephone (Mine) 39
Timber Framer 7
Tools, Pneumatic 8, 9, 74
Tramways, Wire Rope 48, 51
Transformers 27
Transmission Rope 48
Tube Mills 3, 6
Tube Wells 5
Turbines 5, 49, 58

Valves 73
Valves, Pump 73

Washers for Coal 7, 9, 46, 51
Water Columns 5
Water Gates 5, 49
Water Skips 5, 49
Water Softeners 26
Water Wheels 5, 16, 49
Well Drilling Machinery 52, 53
Wire Cloth 42
Wire Rope and Cables 48, 73

Zinc Ores 69, 70, 71, 72

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that our service, backed as it is with 20 years' experience and the best equipped plant in existence, can save money for you.

Ask for our handsome illustrated book "Perforated Metals", then judge for yourself.

The Hendrick Manufacturing Company, Carbondale, Pa.

New York Office, 149 Broadway.

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Write for our Descriptive Pamphlets. Correspondence Invited.

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SUNDRIES: Flourspar, French Chalk, Graphite, Talc, Pencils and all Foundry Requisites

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YORK, PA.
STRUCTURAL WORK,
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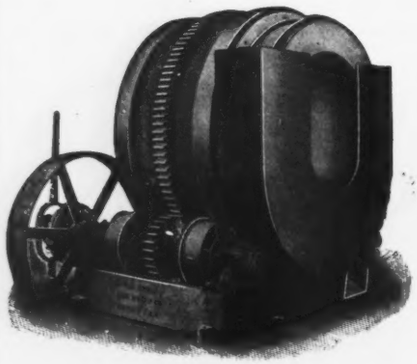

The Ferraris Wet Crushing Ball Mill

Receives the ore direct from the crusher and delivers a perfectly sized, granular, product, suitable for concentration or cyanidation.

UNEQUALED FOR

Large Capacity, Low Cost of Repairs,
Quality of Product, Cheapness of Operation.

FULLY DESCRIBED IN CATALOGUE No. 37.

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Mine, Mill and Smelter Machinery,
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MARK
Rolled Chrome Steel
Shells and Rings

Forged, Punched and Rolled from a Solid Chrome Steel Ingot

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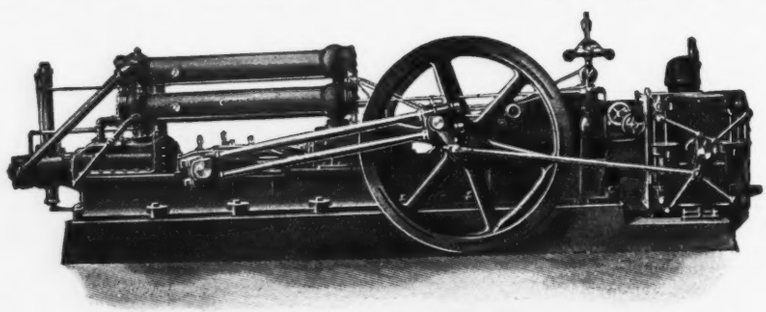

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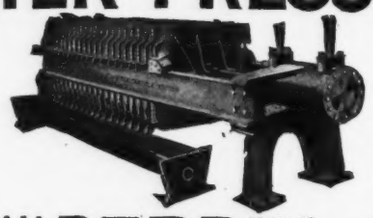

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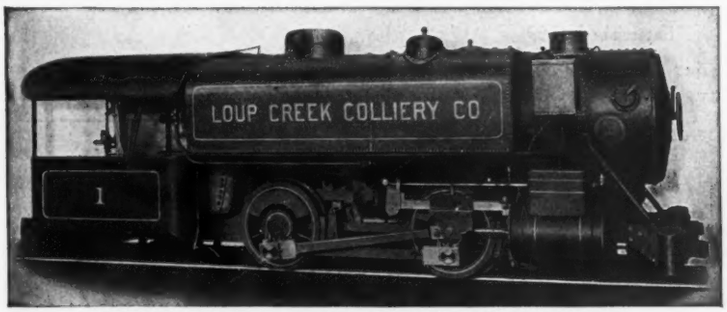

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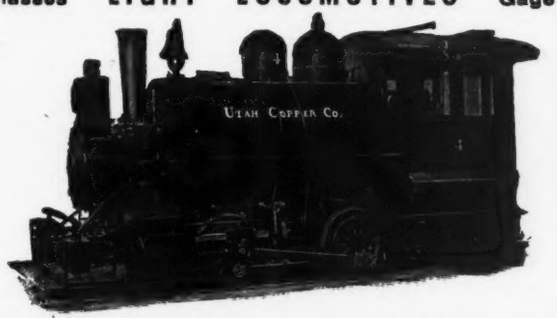

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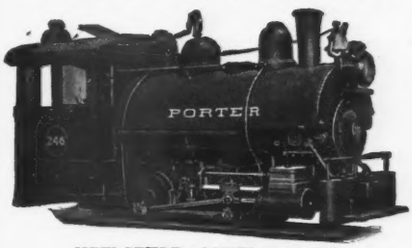

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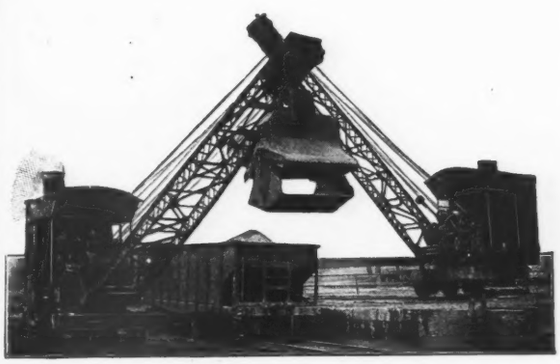

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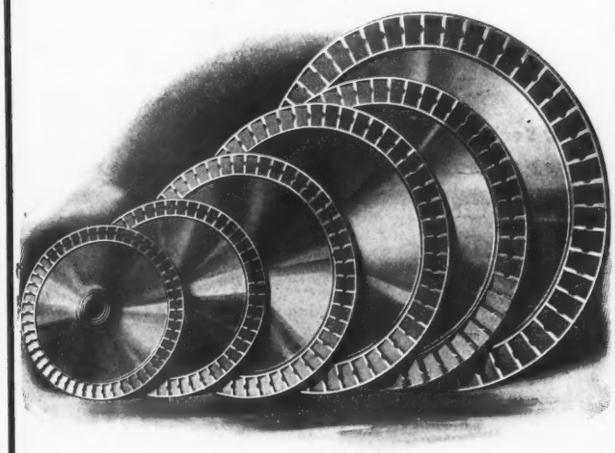

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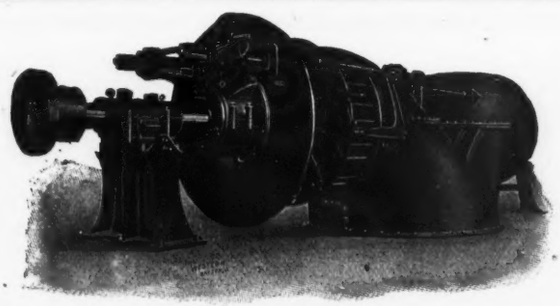

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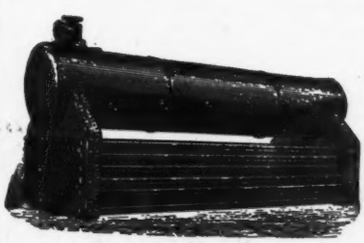

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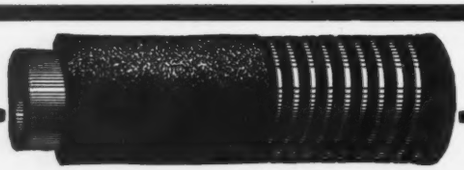

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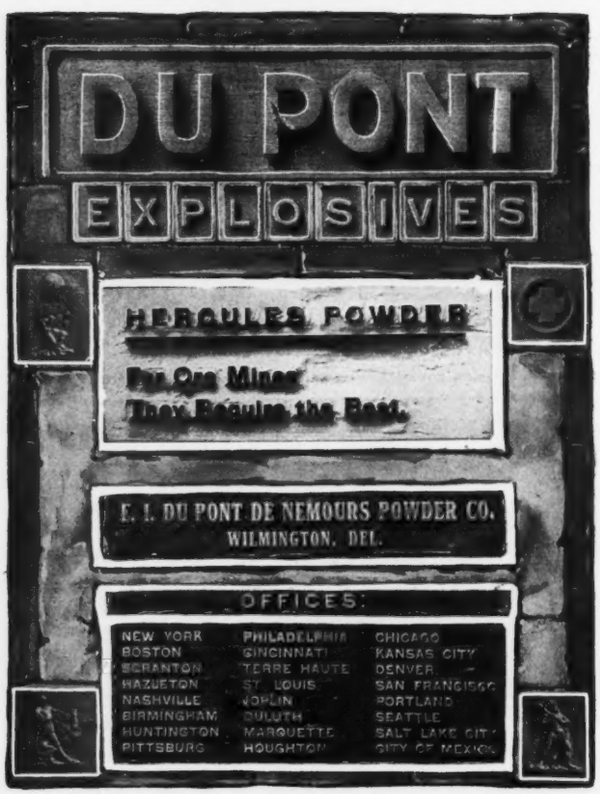

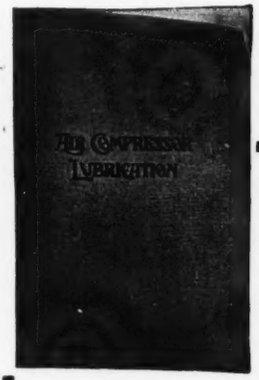

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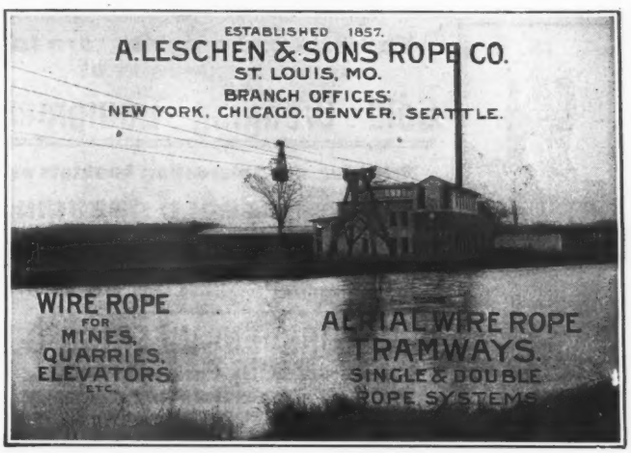

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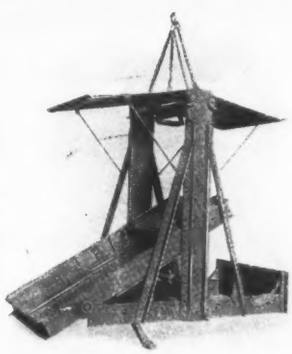

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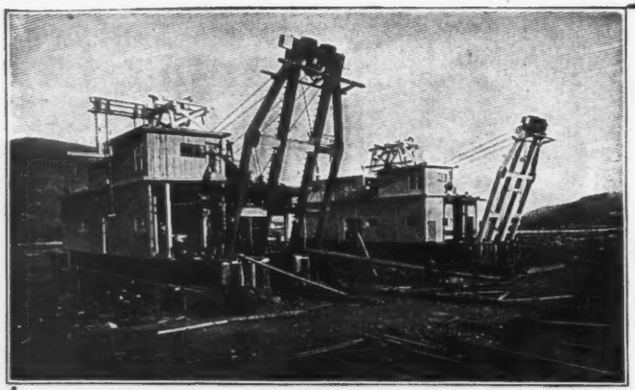

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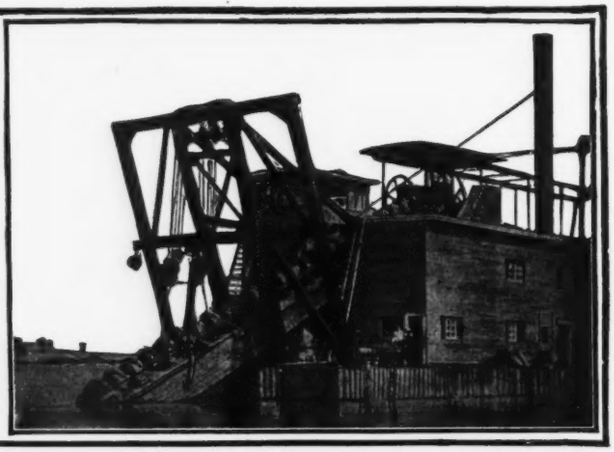

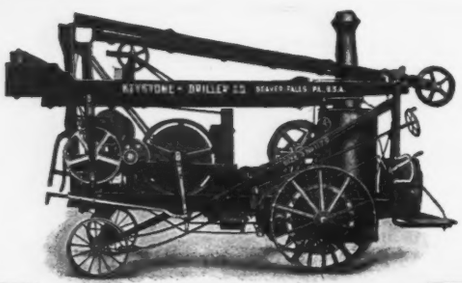

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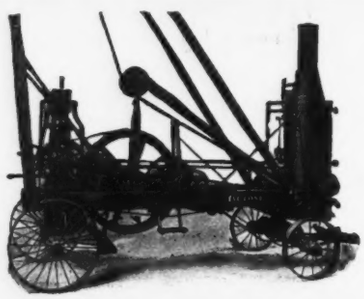

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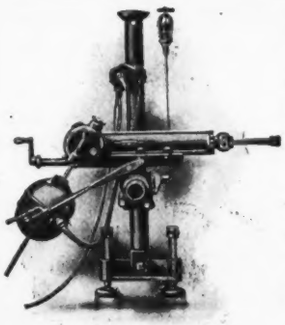

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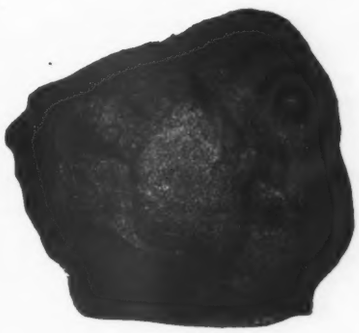

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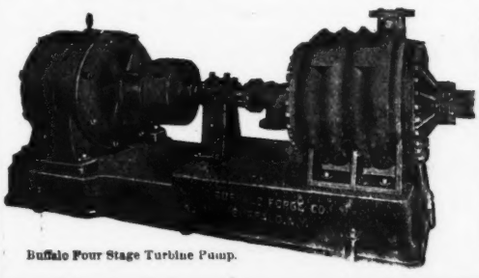

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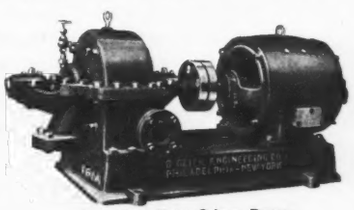

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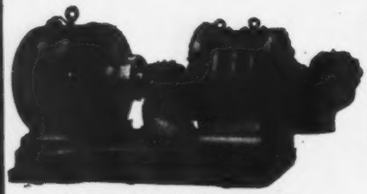

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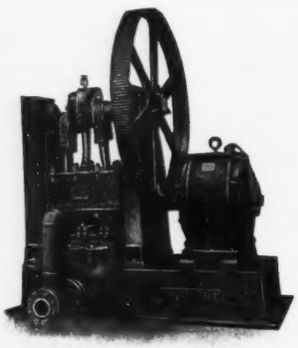

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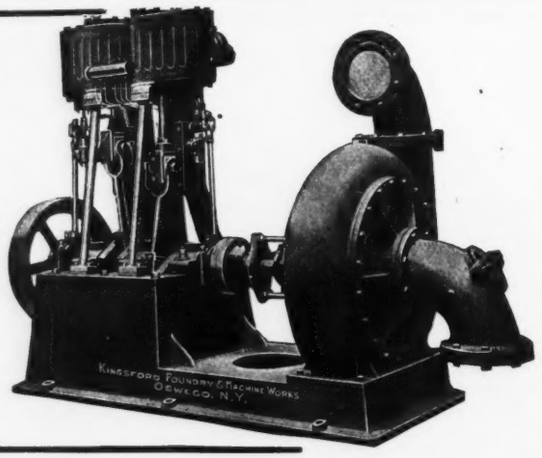

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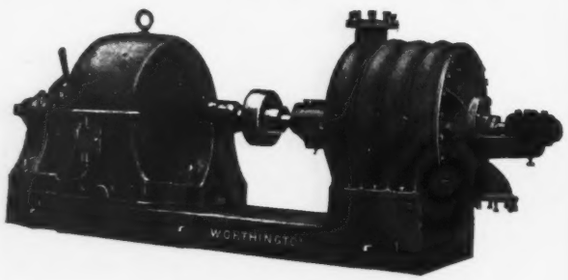

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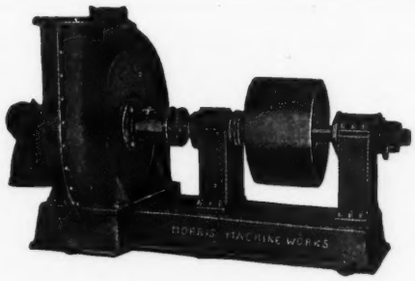

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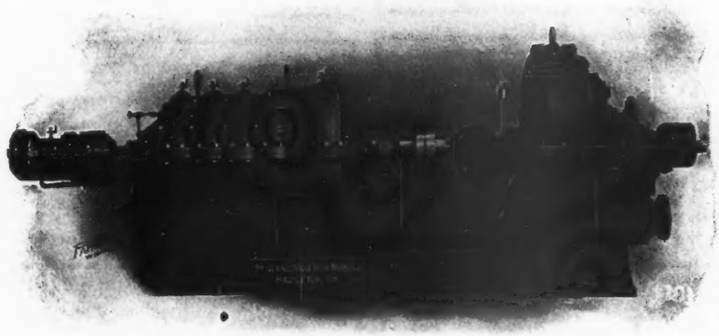

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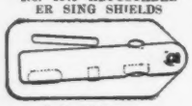

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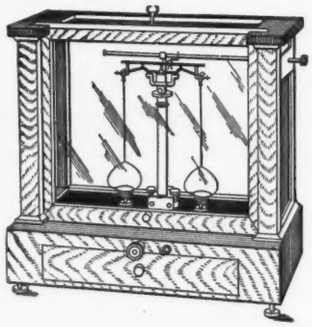

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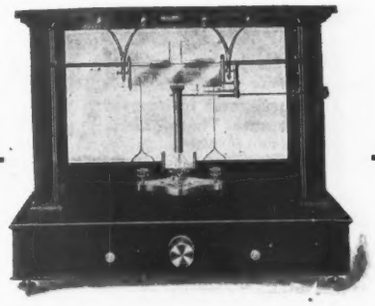

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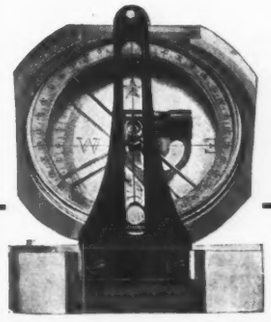

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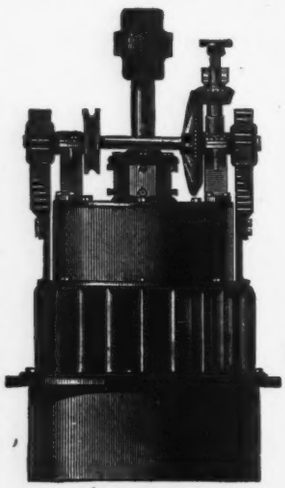

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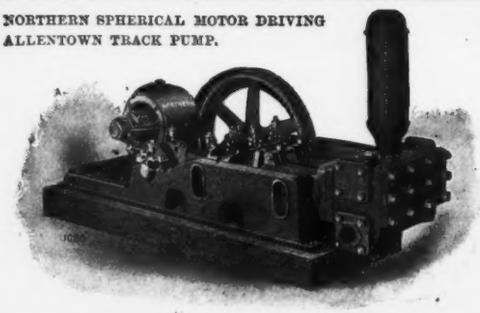

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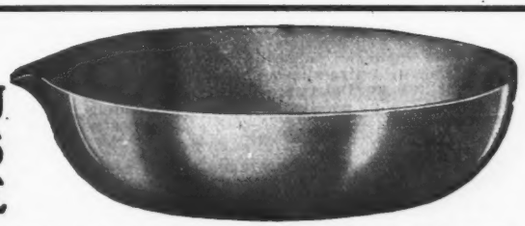
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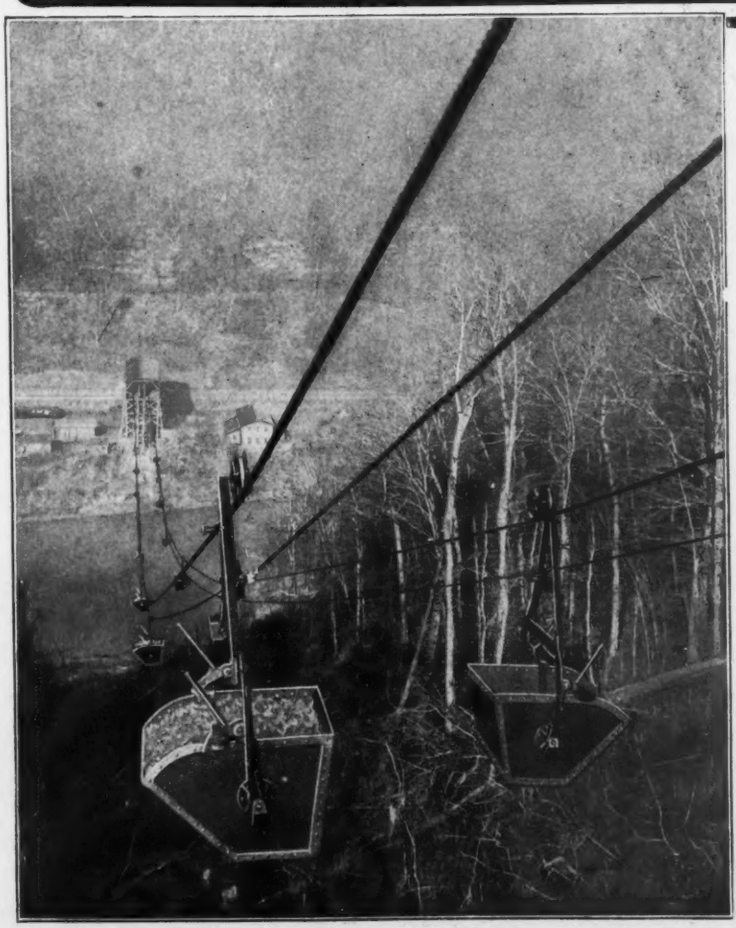

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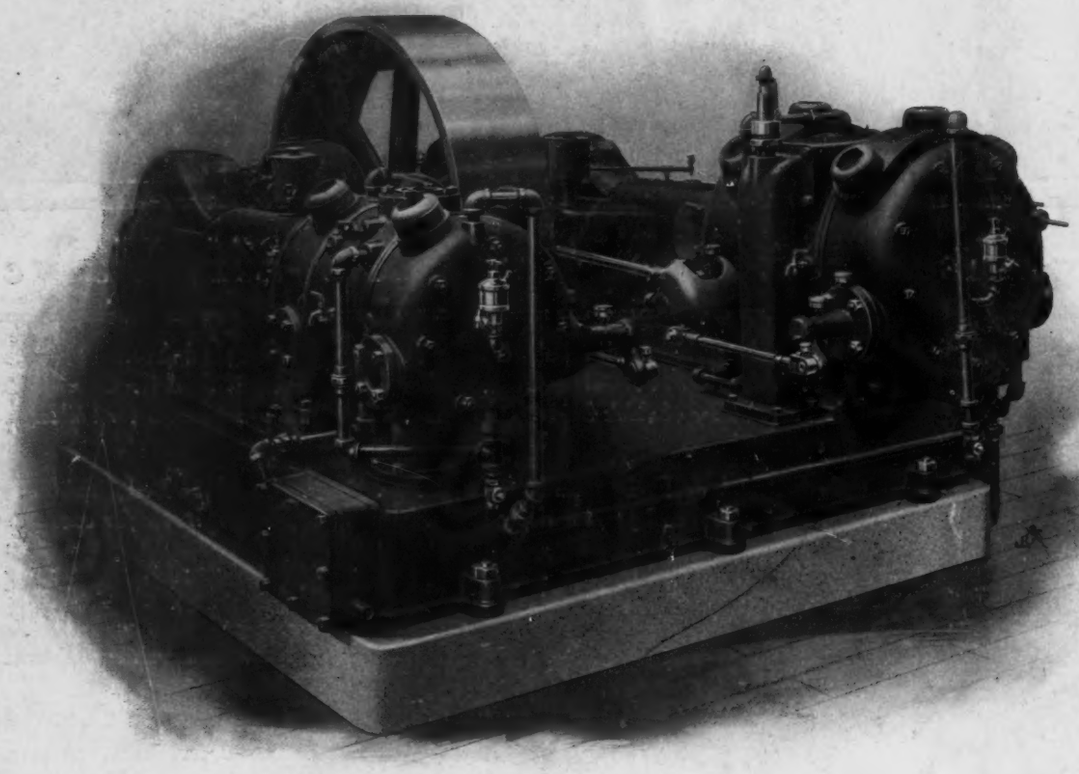

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